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TWO SECTIONS—SECTION 1

Engineering and Mining Journal

With which is consolidated Mining and Engineering World

Volume 103, No. 3
Issued Every Saturday
Hill Publishing Company

NEW YORK, JANUARY 20, 1917

Price, 15 Cents
Contents, First Page
Advertising Index, Last Page

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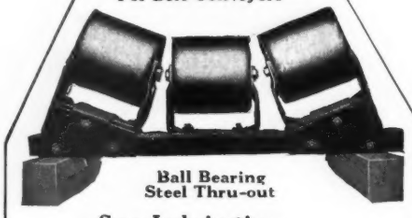

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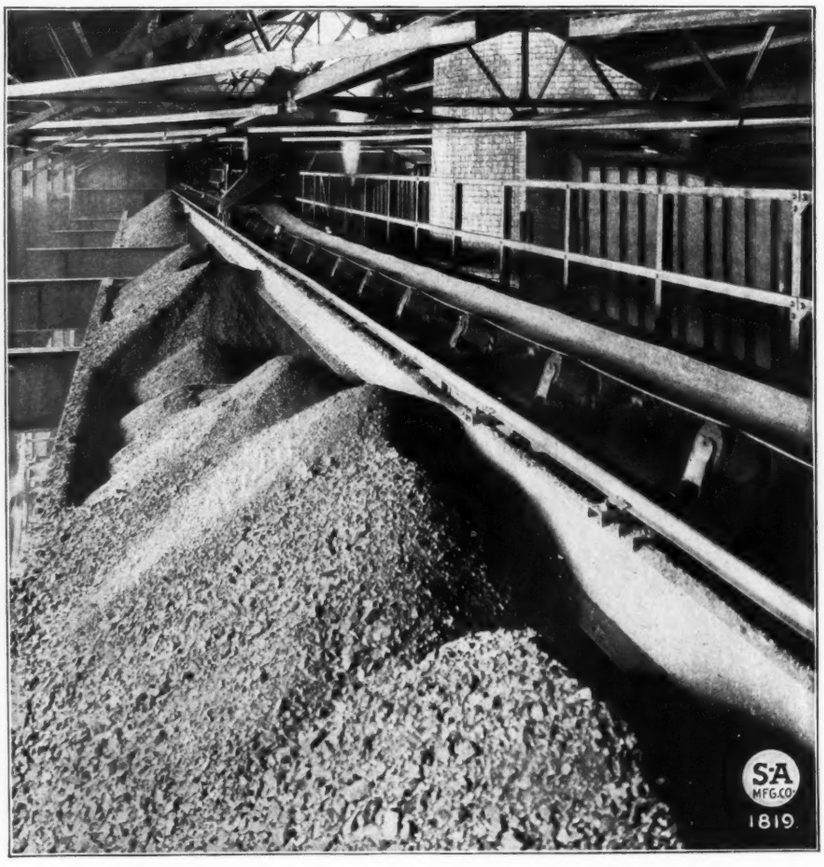

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Engineering and Mining Journal

VOLUME 103 JANUARY 20, 1917 NUMBER 3

The Rochester Cyanide Mill

By A. C. Daman*

SYNOPSIS—The Rochester mill has a capacity at present of 120 tons per day and is operated by a force of 11 men per shift. Automatic operation has been developed to a high degree of efficiency. A total of 230 hp. is used, transmitted at 66,000 volts and transformed to 440 volts in two steps. By the addition of an extra tube mill, a classifier, two thickeners and an agitator, the capacity is to be increased to 160 tons per day.

The Rochester district, 9 mi. from Nenzel, Nev., can boast of two of the best cyanide mills in the country, the Rochester and the Nevada Packard. At present the Rochester mill is taking ore from its own mines in the district, the leasing system having been abandoned in the latter part of 1915.

The ore, after about 35% is rejected, is conveyed from the mine to the mill, a distance of two miles, in 20-ton cars by the Nevada Short Line Ry., and dumped into five 60-ton bins. With a straight line from the mine to the mill and a drop of over 900 ft., the installation of an aërial tramway system has been contemplated, to obviate difficulties in the present transportation and cut down the haulage costs.

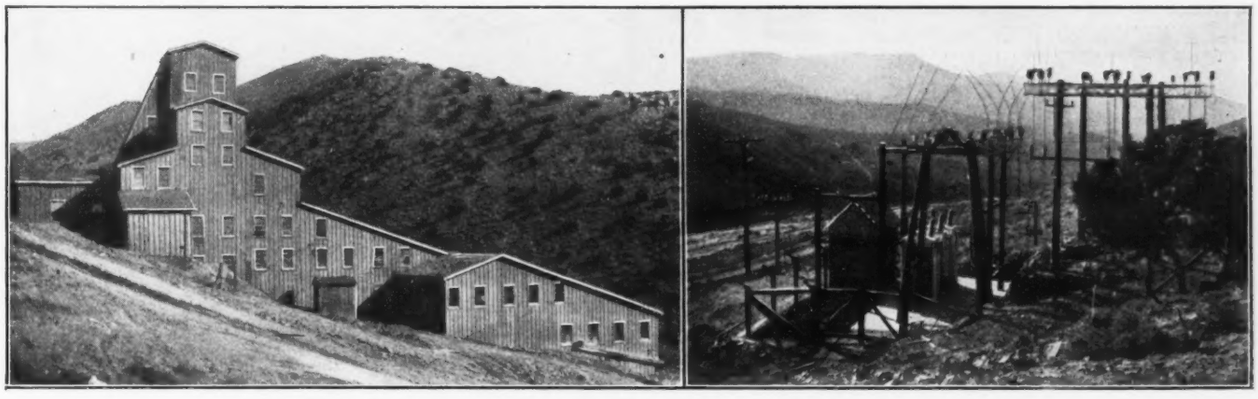
The ore is trammed from the bins in 1½-ton cars a distance of 50 ft., weighed on a Fairbanks recording beam scale and then dumped over a grizzly with 1½-in. openings, finally passing into a 20x10-in. Blake crusher. The fines through the grizzly and the crusher product pass into a bucket elevator and are raised into the battery bins. One crusherman and one trammer handle the ore during the "graveyard" shift, so as not to increase the peak load when the mine compressor is running. The ore is fed to the two batteries of five 1550-lb. stamps by two suspended Challenge feeders. The batteries have chrome-steel parts and make 100 six-inch drops per minute. The back-geared motors which drive the batteries are of a heavy mill type, with the gear cases securely braced and have thus far proven very satisfactory. I have noticed that where back-geared motors gave trouble it was due to the following reasons: Motors too small in weight and size to withstand the vibrations of the stamps or the pull of the belt; accumulating ridges of belt dressing on the pulley wheel, giving the motor a jar every time the belt rolls over a ridge; poor motor foundations and bearings. I have known of cases where the motor vibration was so great as to throw the oil out of the oil wells, it then being only a matter of time before the bearing would break or melt away.

Mechanical sampling has been abandoned, and a special head sample is taken at the weir of the Dorr classifier overflow at half-hour intervals. The sample when taken is put in a small mechanical agitator worked by a belt from the Dorr classifier. The entire sample is saved and thoroughly mixed, and an accurate determination for moisture is made. The washed slimes and solution of sample are assayed, and so is the drip sample of the stock solution before entering the batteries. The formula is

$$H = A + R(B - C)$$

in which

H = Heads;
A = Washed sample of sample agitator;
B = Solution from sample agitator;



THE ROCHESTER MILL AND A SUBSTATION IN THE ROCHESTER DISTRICT

*Mining engineer, 2678 Eudora St., Denver, Colo.

C = Drip sample of battery or stock solution;
R = Ratio of solution to ores in sample agitator.

The head sample obtained is checked against the bullion plus the tailings. During nearly a year's trial of this head sample, it was found to be 3% less than the bullion plus the tailings value. Formerly a check was tried by means of a grab and automatic sample, but neither was as satisfactory as this method. The object of continual agitation is to get higher dissolved values, thus reducing the chance of error, though very accurate results are obtained by using a bucket instead of the agitator.

The crushed ore is carried through the 4-mesh screens of the batteries, directly into the tray of a duplex Dorr classifier, which in turn is in closed circuit with the two 5x16-ft. tube mills. Screen tests are taken daily, and the following is the average for the month of September, 1916:

SCREEN TEST—ROCHESTER MILL

Screen tests	+200	−200
Battery discharge	81.0%	19.0%
Tube-mill discharge	66.4%	33.6%
Tube-mill intake	90.7%	9.3%
Classifier overflow	19.0%	81.0%
Tailings	18.3%	81.7%

The tube mills are of the trunnion type connected by silent chain drives to the pinion shaft. The tube-mill speed is 24 r.p.m. About 700 lb. of Danish flint pebbles are fed into scoop of each tube mill per day. The discharge of the tube mills has ½-in. grating.

The slime overflow from the Dorr classifier goes to thickener No. 1. The clear overflow from this thickener flows by gravity into a clarifying tank containing twenty 6x8 ft. filter leaves. The difficulty of cleaning the filter leaves by lifting each leaf one at a time is considerable and, I think, could be improved upon by emptying the filter tank of pregnant solution, reversing the outlet of the tank and washing the accumulated slimes and pulp off the leaves with high-pressure water into the thickener or agitator circuit. Reversed water and air could be passed through the leaves and with hose and scraper wash off the leaves without removing them from the tank except for acid treatment. To avoid intermission of the precipitate a two-compartment tank could be used. To get at the leaves properly for cleaning they would have to be spaced about six inches apart. The clarified solution is pumped into a small storage tank from which it flows to the 12 five-compartment zinc boxes. The underflow of the primary thickener is pumped continuously by means of a diaphragm pump into agitator No 1. It is here agitated in contact with fresh cyanide solution, the solution strength in the agitators being kept about 1.3 lb. KCN and 1.9 lb. CaO per ton. By reducing the solution strengths from the former 4 lb. KCN and 2.5 lb. CaO per ton, the mechanical losses of cyanide have been reduced from 1.13 to 0.31 lb. KCN.

Two flow sheets were used in the mill. The scheme in Fig. 1 shows the three agitators in series between thickeners Nos. 1 and 2, with barren solution added in thickener No. 4 and water replacing the lost solution in No. 6. The pulp, upon leaving No. 3 agitator, enters No. 2 thickener and passes by continuous decantation to No. 6, the solution flowing in reverse direction by gravity. The pulp or underflow of the thickeners is raised by diaphragm pumps.

Up to September, 1916, the scheme of decantation shown in Fig. 2 was used having two diaphragm pumps in series to lift the pulp from No. 2 thickener to No. 3 agitator, thus getting a complete change of solution during agitation. This scheme proved the best in that it gave greater extraction and less dissolved values in the tailings, but owing to the breaking down of the two diaphragm pumps of an obsolete type, the scheme of Fig. 1 was adopted and will be used at least until the new pumps arrive.

The diaphragm pumps gave considerable trouble at first. The hinge valves in the diaphragm would catch wooden particles, preventing it from closing and diaphragms would have a short life. Most of the troubles have been obviated by reducing the stroke from 4 in. to 2½ in. and putting in vertical lift valves in the diaphragm, similar to those used in piston pumps, instead of the hinge valves. The volume of pulp handled is regulated by admitting air to the suction side by means of pet-cocks. The stroke of the pump is given by means of 7- to 12-ft. rods connected to overhead eccentric drives.

ELECTRICAL-POWER DISTRIBUTION

Motors	Rated Hp.	R.P.M.	Type	Hr. Run per Day	Load, Hp.	Total Hp.-Hr. per Day	% Total Load	Hp-Hr. per Ton Milled	Kw.-Hr. per Ton Milled
Crusher — 20x10-in. Blake elevator bucket	15	860	S. C.	8	15	120	2.64	1.00	0.746
Elevator and pulverizer	15	1,150	S. C.	8	7	56	1.23	0.47	0.348
Two batteries—ten 1,550-lb. stamps	20	680	S. R.	24	38	912	19.97	7.59	5.663
Tube mills—two 5x16-ft. mills	100	575	S. C.	24	110	2,640	57.90	22.00	16.412
Thickeners and agitators—six thickeners, six diaphragm pumps, two agitators, 3 plunger pumps, zinc lathe	15	1,150	S. C.	24	16	384	8.43	3.20	2.393
Mill compressor—mill comp. and mach. shop	15	1,150	S. C.	24	15	360	7.90	3.00	2.238
Extra mill compressor	30	1,150	S. C.	..	20	..	..	..	..
Lights and miscellaneous load	...	....	....	..	....	88	1.93	.74	.548
Total	230				221	4,560	100.00	38.00	28.348

S. C. = Squirrel cage. S. R. = Secondary resistance = slip-ring type.

The barren solution is metered by a tilting-box type device and then passes into thickener No. 4. From 600 to 700 tons of solution is precipitated each day.

The electric power is bought from the Nevada Valley Power Co., at a cost of $8 per horsepower-month. The transmission voltage is 66,000 volts and is transformed twice to get the 440 volts used in the mill. The sizes of the various motors are shown in the accompanying table.

From these figures it will be seen that the thickeners, agitators, diaphragm pumps, solution pumps, Dorr classifier and the mill air compressor comprise only about 16% of the total load, which is comparatively low, but characteristic of all continuous counter current decantation plants. No auxiliary power is used to run the thickeners and agitators in case of power shutdown, which, if off for several hours or more, would necessitate turning of pulleys by hand.

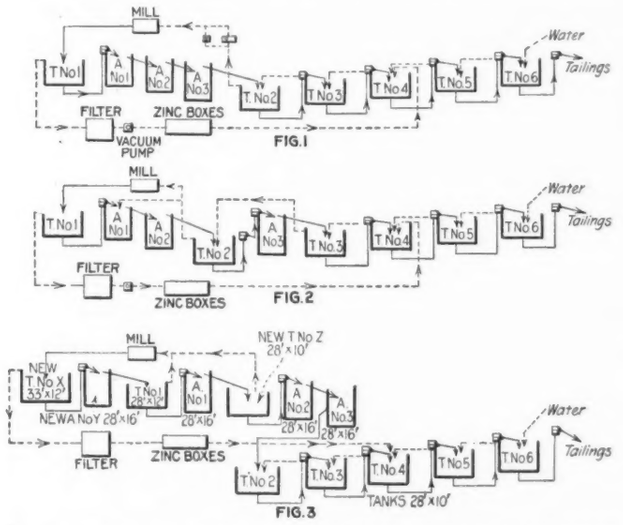
Silver in the form of silver-antimony sulphide is the principal constituent of the ore, in contrast with silver chloride of the Nevada Packard mine. The secret of treating the Rochester ore is fine-grinding and long agitation, and it is with these points in view that C. W.

Poole is designing his new additions to the mill. At the Rochester mill 85% extraction is obtained in No. 3 agitator, while at the Nevada Packard the same extraction is obtained practically in No. 1 agitator. This illustrates more fully the different grade of ore treated by the two mills. The chemical consumptions are as follows, per ton of ore: NaCN (mechanical), 0.561 lb.; NaCN (chemical) 0.448; lime, 10.54; litharge, 0.192; lead acetate, 0.30; pebbles, 16.66 lb. per ton; and zinc, 1.22 oz. bullion (troy oz. Zn).

Approximately 40 lb. NaCN per shift is added, 30 lb. in No. 1 agitator and 10 lb. in No. 3 agitator.

In the assay office the following flux is used for both mill and mine samples: 20 lb. litharge, 10 lb. soda, 4 lb. borax, 1 lb. flour, 1 lb. potash.

Construction work is now in progress on additions to the mill, consisting of an extra 5x16-ft. tube mill, Dorr classifier, two Dorr thickeners and one Dorr agitator. The mill will then have a capacity of 160 tons, against the present 120 tons. The stamp duty will be raised from 12 tons to 16 tons by using two-mesh screens. The method of decantation is shown in Fig. 3. It is the contention of Mr. Poole that by the addition of the new agitator and a double change of solution, the complete



FIGS. 1 AND 2. FLOW SHEET FOR 120-TON CAPACITY. FIG. 3. CAPACITY INCREASED TO 160 TONS

dissolution of values will be accomplished when the pulp leaves the last agitator. The dissolved loss by decantation will then approximate the theoretical value.

The general layout of the mill is excellent, and every inch of room is in sight of the shiftmen all the time. Placing the machine and carpenter shops in small-sized mills, where all necessary mill supplies are also kept, is now becoming common practice, and those of us who have crawled through storehouse windows or had to wake up the storekeeper at midnight in order to get a few nails or perhaps a wrench can fully appreciate the advantage of this.

All pump lines have at least two 45° elbows with high-pressure water connection to quickly clean out a pipe line if stuck. The entire mill crew consists of one foreman, three battery and tube-mill men, three solution men, one precipitate man, one repairman, one crusherman and one trammer, a total of 11-man shifts. Upon completion of the aërial tramway and mill additions, the primary crushing will be done at the mine by the ore sorters, and the ore will be dropped directly into the battery bins. The mill force will then consist of 9-man shifts with the daily tonnage per man raised from 11 tons to 18 tons. For cyanide plants the latter figure is far above the average.

I am indebted to C. W. Poole, general superintendent of the Rochester Mines Co., and W. G. Emminger, assayer, from whom I secured much valuable information.

As a concluding remark I want to add that I never was in a mill before in which the millmen were so contented, efficient and "at ease" as in the two mills of the Rochester district—the Rochester and Nevada Packard mills. It seems at last a cyanide millman can go around his business overlooking his equipment instead of running around the mill with a monkey wrench. With the addition of automatic sampling devices the Rochester mill will be as nearly automatic as it can be made.

Graphite in Madagascar

Mining in Madagascar, French East Africa, is the subject of some comments by James G. Carter, United States consul at Tamatane, published in a recent supplement to *Commerce Reports* of the Department of Commerce.

The mining situation was far better in 1915 than it had been for several years, with the exception of precious and semiprecious stones and corundum, which showed sharp declines in production and exportation. The production of graphite is reported to have been about 15,000 tons, against about 8000 tons in 1914, 6319 tons in 1913, 5000 tons in 1912 and 1500 tons in 1911. Because of the large demand for this mineral in France and England, the local government has called upon the producers throughout the island to increase their output, and it is believed the production for 1916 will greatly exceed 20,000 tons.

As previously stated, all the Madagascar graphite exported is supposed to be shiped to Marseilles, France. In June, however, a British ship took on a cargo of about 2000 tons for England, and another ship of the same nationality was loaded in August with a similar quantity for London. These shipments, which have been specially authorized, are being made by the Graphites Maskar Co., allied with the Morgan Crucible Co., of London, who, during the last five years, have been large purchasers of Madagascar graphite through buyers at Tananarive.

Efficiency of Compressed-Air Installations

In the article on "The Efficiency of Compressed-Air Installations" in the *Journal* of Dec. 16, 1916, one of the formulas was published wrong. The author of the article asks us to correct this error, which escaped his attention in spite of the care taken in preparing the article. The formula was printed

$$T_2 = T_a \left(\frac{P_2}{P_a}\right)^{\frac{n}{n-1}} = 0.29$$

but it should have been

$$T_2 = T_a \left(\frac{P_2}{P_a}\right)^{\frac{n+1}{n}} = 0.29$$

Fortunately the numerical value of the exponent was correctly given in that formula, so that a reader could not help seeing that the error was not one of principle.

The Commission for Relief in Belgium

By William L. Honnold*

SYNOPSIS—The commission with its principal purchasing office in New York is feeding 9,000,000 people and has $3,000,000 per month less than is required to provide Belgium with what is considered a minimum living ration. Even if this extra $3,000,000 were forthcoming the ration would be one-quarter to one-fifth less than is received by prisoners of war and one-third less than is provided in England's workhouses. Marvels of scientific organization have been accomplished under Hoover's management. America is far behind in the giving. The British Empire has contributed 18c. per capita compared with only 8c. by the United States, while Canada has given 18c.; Australia, $1.23; New Zealand, $1.98; and Tasmania, $6.53 per capita.

There is no need to refer in detail to the initial tragedy of Belgium—the broad facts are well known. To the people of the country it came as a bolt from the blue, destroying in a night, as it were, all that seemed worth while and leaving them dazed and unnerved in the presence of overwhelming disaster and dread.

As a corollary, there was general, if not complete, disorganization or suspension of the agencies and supports of national life. Industry was in large measure paralyzed. Imports suddenly stopped. Local supplies of food and materials were in part taken over by the military and in part subjected to the dislocating influences and abuses of war time, whether at the hands of the invaders or of the people themselves. Communication and transportation were inhibited. Currency disappeared, banks were closed, credit was withdrawn and confidence generally destroyed. In fact, the complicated mechanisms of government and society were suddenly thrown out of gear and ceased to function.

What this meant in a country with a density of population twenty times greater than our own, whose people had been engaged chiefly in industrial occupations and had lived under corresponding conditions, and where, previously, less than 40% of the food consumed had been produced locally, can be left to the imagination. Suffice it to say that in a short time the country was face to face with famine.

Selection of Hoover to Head Organization

Prompt help had to be secured. A few resident Americans and leading citizens got together, the support of the American and Spanish ministers was enlisted, and an undertaking was obtained from the invading army, which was later confirmed and enlarged by the German government, to the effect that protection would be afforded if food were imported. Representatives were sent to London and, with the assistance of Ambassador Page, the consent of the British government was secured, conditional on neutral control, as well as Washington's permission for American citizens to collaborate in relief measures. Asked to nominate the head of an organization to take the matter in hand, Mr. Page named Herbert C. Hoover, with whom he had throughout consulted on the subject and whose marked capacity and resourcefulness as an organizer had been brought to his attention in connection with the American Relief Committee, which rendered such signal service in facilitating the return to America of thousands of citizens stranded in London at the outbreak of war.

Mr. Hoover at once went to work, utilizing the American Relief Committee organization, which was somewhat increased in membership and reconstituted, under the patronage of the American and Spanish ambassadors and ministers, as the Commission for Relief in Belgium. Although less than $500,000 was available and only emergency relief was then contemplated, it was decided to place orders for 20,000 tons of food per month. This meant an obligation of some $2,000,000. But the commission believed in a generous response if the world were appealed to, and a generous response was in fact forthcoming. It soon became clear, however, that so great an undertaking could not be maintained on a basis of benevolence only. Government subsidies offered the only hope, but the circumstances were not reassuring; certainly there were no favorable precedents. Mr. Hoover's resourcefulness, however, was equal to the emergency. With the assistance of the American Ambassador, he was able to bring the matter to the attention of the British Cabinet and to secure the support of that government. Then the French were approached and readily agreed to coöperate. The outcome was a monthly advance to Belgium for account of the commission of £500,000 from England and 12,500,000 francs from France. This meant at first roughly $5,000,000, but owing to shrinkage in the rate of French exchange, in practice it soon proved to be only $4,500,000. To this was later added 25,000,000 francs, or $4,000,000, per month from French institutions in respect of the area occupied by the Germans in northern France. With these funds, added to the more or less sustained benevolence of the world, it was possible until a few months ago to render a living measure of relief in both areas.

Increased Cost of Supplies Hampers Work of Commission

In recent months, however, the increased cost of supplies, coupled with greater requirements, has rendered the resources of the commission quite inadequate to the demands. So a further appeal was made to the governments concerned. England has been able to double her advance to Belgium. France has increased her contributions in respect of her own people in northern France to the extent of 40%, but has not been able for financial reasons to increase her advance to Belgium. Consequently the commission is today some $3,000,000 per month short of the amount required to provide Belgium with what is considered a minimum living ration. Just what this means may perhaps be best shown by stating that, even if this extra $3,000,000 were forthcoming, the ration available for the destitute would still be more than 20% inferior to that given by the Germans to their war prisoners, more than 25% inferior to that given by England to her war prisoners and about ⅓ less than is commonly provided in England for the inmates of workhouses.

*Director in America, 120 Broadway, New York.

It is partly to meet this deficiency that the commission has asked the American people to give $1,000,000 per month, say one-tenth of the total requirements, to cover the cost of a much needed supplementary meal for the schoolchildren, this seeming to be the most effective means of safeguarding the coming generation against the ravages of tuberculosis and other diseases now increasing at an alarming rate in consequence of the inadequate food supply. In the face of such a situation is it too much to ask of America that she support the commission to the extent asked for? Surely, it is a matter of national pride that in the name of America it has been possible so long to succor this sorely stricken people. How great is America's responsibility could hardly be shown more convincingly than by the following bits of diplomatic history.

Agreements with Belligerent Governments

The first agreements with the belligerent governments concerned, effected through the good offices of the American and Spanish ambassadors and ministers, provided that ships in the service of the commission would be passed through the blockade of the Entente Governments and not attacked by the submarines of the Central Powers, and that the food imported would reach only the civilian population, the Germans undertaking to facilitate its distribution and leave it unmolested. Subsequently, the Germans undertook not to acquire any locally produced foodstuffs that would have to be replaced by importations. And still later, in March of this year, they agreed not to permit the exportation of any food supplies whatever, regardless of their origin. These agreements have been on the whole faithfully observed, with a general tendency to correct incidental irregularity and misconstructions.

At times, the members of the commission have been, if not weary in well doing, at least disposed to consider whether their services were really indispensable; the idea being that, with the coördinated Belgian organizations so well perfected, it was, if possible of arrangements, desirable that the people of the country should themselves continue the work. This attitude has been largely out of consideration for the susceptibilities of the Belgian people, but in a subordinate sense has been influenced by the fact that some of the commission have too long neglected their personal affairs. So, in February last the British Foreign Office was addressed through the American Ambassador in this sense. Sir Edward Grey's reply to Mr. Page was as follows:

> I have carefully considered your letter of Feb. 25, inclosing a letter from Mr. Hoover regarding the possibility of the retirement of the American commission from the direction of the relief work in Belgium.
>
> I quite appreciate the desire of the commission to divest themselves of the burden entailed by this work, which they have borne for so long, but I must state clearly that His Majesty's government can only allow the work of relief to continue if the entire responsibility for it both inside and outside Belgium is borne by neutrals who, having complete freedom to come and go and having no official position limiting their personal liability, can in fact be held responsible for the carrying out of the various conditions upon which His Majesty's government has insisted. The American commission is the only organization which fulfills these requirements, and His Majesty's government therefore feels obliged to insist that either the whole work shall cease, or the American commission shall continue to direct it as heretofore.
>
> I shall be glad if you will convey these observations to Mr. Hoover, and ask him to reconsider his views in the light of these considerations.

Clearly, there was no alternative for the commission but to continue. Its responsibilities, in fact, are now so exactingly defined as to render the work in the nature of a national service. The members so regard it and feel that they are entitled to ask with unusual assurance for both the moral and financial support of their countrymen.

That the commission is not unequal to the responsibilities entrusted to it is not only shown by its survival, but also by such words of official approval as those uttered by the British Prime Minister on an important public occasion in May last. Mr. Asquith stated, *interalia,* that

> The practical problem of how to feed a nation suddenly confronted with the prospect of starvation and hemmed in by a hostile army presented unexampled difficulties. At the request of His Excellency, my friend Dr. Page, Mr. Hoover undertook the work and formed, under the auspices of the American and Spanish diplomatic representatives, what is now known as the Neutral Commission for Relief in Belgium. A noble friend and colleague of mine, Lord Curzon, has described Mr. Hoover's work as "a miracle of scientific organization." That, I believe, is not an over-statement. With the people in northern France, which is occupied by Germany, added to those in Belgium, Mr. Hoover and those associated with him have had to provide, and are providing every day, food for over nine million persons, five million of whom are practically destitute.
>
> My Lord Mayor: The enormous volume of shipping and food supplies rendered necessary naturally brings the operations of the Neutral Commission under the closest supervision of the Admiralty and the War Office here. I am glad to be in a position to say on behalf of those departments of His Majesty's government, that we are convinced that the relief food reaches the Belgians and the French and reaches them alone.
>
> I am desired to express on behalf of the government our deep gratitude to Mr. Hoover and to those American citizens who have so nobly given up their time and their occupations without recompense, and to a large extent without recognition, to this work of purchasing, shipping and distributing the supplies, which alone enables the population of Belgium to keep body and soul together. It is one of the finest achievements in the history of humane and philanthropic organization.

It will not be without interest if brief reference be made to the activities of the principal offices, thus visualizing, more clearly, perhaps, than is commonly understood, the scope, magnitude and efficiency of the work. Apart from matters of general policy, each office is essentially autonomous as to control.

Tonnages Purchased and Dispensed

The New York office is the main purchasing and shipping branch, particularly as to wheat and pork products. Up to the end of November a total of 1,587,890 tons of cargo had been dispatched, of which 1,227,420 tons, say 45,823,680 bushels, was wheat. The commodities dealt in are obtained from all the markets of the country, and their purchase, transportation and loading are matters of obvious importance. Altogether, the outlay in America had, at the end of November, totaled $125,451,473, or more than 14 times the amount benevolently contributed by this country. This office also carries on an active campaign in behalf of benevolence throughout the United States, and has so far collected about $8,750,000 in food, clothing and money. This amount is large in the aggregate and undoubtedly includes many generous contributions. When reduced to a per capita basis, however, it reflects a comparatively poor response, especially if regard be had for the high standard of individual wealth and the fact that, through the commission's purchases, the United States has profited so largely. The people of the British Empire, apart from the large advances by their government and notwithstanding the heavy demands of the war in other directions, have contributed 18c. per capita as compared with an average of only 8c. by the United

States. Canada has given 18c., Australia $1.23, New Zealand $1.98 and Tasmania $6.53 per capita.

Rotterdam is the destination of all the commission's ships and the point where their cargoes are transferred to canal barges for distribution throughout Belgium and Northern France. At the end of October that office had discharged 366 oversea and 763 cross-channel ships, say 2,164,218 tons of supplies, and loaded and dispatched 5913 canal lighters. Truly a large business, its efficiency being reflected by the fact that the average inclusive handling charge was 89c. per ton.

The Brussels office is of course the most vitally interesting center. Its responsibilities cannot be better indicated than by quoting from a recent diplomatic definition of the commission's position:

> The commission must maintain in Belgium an entirely independent organization composed of responsible and capable directors and managers, responsible directly to the chairman of the commission and numerous enough to secure the adequate representation of the commission and the execution of its duties throughout Belgium. Such form of organization and distribution shall be maintained as will secure that all foodstuffs and relief shall be distributed and administered with justice and equity and shall reach their destination with the minimum possible risk of leakage.

From this it is clear that the Brussels organization must not only follow closely the technical and commercial aspects of transportation, milling and distribution, but must also maintain such intimate relations with the coöperating Belgian committees, the American and Spanish ministers and the German authorities as to insure that both food and benevolence are dealt out to the population of approximately 7,000,000 people in strict accordance with the controlling conventions. The burden of the actual work of relief is of course mainly borne by the coöperating Belgian organization, the Comité National, an organization which includes the leading citizens of the country and which, through its two thousand or more subcommittees, is performing a truly noble and monumental service.

Matters of Diplomacy, Policy and Finance Settled by Hoover

In addition to its work in Belgium the Brussels office looks after the occupied portion of northern France, where the commission has undertaken to provision the remaining population of some 2,250,000 people. That area is governed directly by the military, and the conditions are such as to permit the inhabitants much less freedom of action than in Belgium, where there is a civil form of government. Consequently, the coöperating French organization, the Comité d'Alimentation du Nord de la France, does not take so prominent a part in the administration of relief, and it is necessary for the commission to collaborate more intimately than in Belgium with the German military authorities. This, however, is not without its advantages in the circumstances, and furthermore, the officers concerned have been, as a rule, men of superior character who have whole-heartedly and with ability contributed to the success of the work.

The head office of the commission is in London, and Mr. Hoover, when not in Belgium, is in a unique sense its presiding genius and source of inspiration. Matters of diplomacy, of finance, of policy, either originate or are settled there. Practically all shipping is chartered by that office, and such articles as do not come from America are purchased there. It is there that the full magnitude and efficiency of the operations are disclosed, as for example, by such figures as those that follow. At the end of the second fiscal year, that is on Oct. 31 last, there had been imported into Belgium a total of 2,190,120 tons of foodstuffs at a cost of $173,658,913 and additional quantities of a value of $28,123,163 were in transit. The total overhead expense of handling this business, which included that incurred by all the offices mentioned above, averaged five-eighths of one per cent. Throughout, the prices at which it has been possible to sell the commission's bread and other supplies in Belgium have been below those in other European countries, and today the price of the commission's bread in Belgium is only 4c. per lb.

Such figures, of course, could not be realized but for the magnitude of the business and the valuable voluntary services rendered by the members of the commission and their supporters. The executive work has been carried on by volunteers of wide experience, whose work has been invaluable. Most of the departmental heads and many assistants, also, are wholly or partly volunteers, fully paid men being employed only in specialized branches for which no experienced volunteer service is available.

Valuable Aid Given by Many Experts

In the matters of purchasing and transportation, the commission has had valuable expert assistance from individuals, firms, corporations, transportation agencies and local committees. Many of these have either returned their fees or have made no charges. Inland purchases have necessitated extensive transportation arrangements, in connection with which the commission has received many generous concessions in rates and a large amount of entirely free transport, to say nothing of continous and valuable favors in the way of extra facilities as to handling and delivery. Likewise, in the chartering and management of the commission's fleet of vessels, very important assistance has been rendered by large shipping firms who have contributed their services in large measure free of charge. Banks generally have helped in the matter of exchange and have paid the maximum rate of interest on deposits. Insurance has been facilitated by the British Government Insurance Commissioners, and the firms who fix the insurance have subscribed the equivalent of their fees. Harbor dues and port charges have been remitted at many points, and stevedoring firms have made important concessions in rates and have afforded other generous services. In Holland, exemption from harbor dues and telegraph tolls has been granted and rail transport into Belgium has been provided free of charge. The German military authorities in Belgium have exempted the commission's imports from custom and canal dues, have reduced railway rates one-half, and on canals and railways have given right-of-way to the commission's foodstuffs wherever called for.

References to services would be incomplete without special acknowledgment of those rendered by the 125 or more men, mostly young and with their life work still to be accomplished, who have unselfishly gone into Belgium and heartily contributed in various capacities to the success of the commission's work.

In London, both accounting and auditing are in the hands of Deloitte, Plender, Griffiths & Co., a firm of world-wide reputation and connections. This firm also audits the accounts in Rotterdam and Brussels, as well as in New York.

All these things, however, are obviously of secondary importance, the primary consideration being the main-

tenance in health of the 9,000,000 or more people for whom the work has been undertaken. To satisfy itself on this point the commission has lately had made a thorough investigation of the health conditions in Belgium to determine the degree of success that has attended the work. Dr. William Palmer Lucas, of the Medical Department of the University of California, who undertook this investigation, spent three months in close association with Belgian physicians and health authorities and arrived at some interesting conclusions. He reports that the agricultural class, which has been able directly or indirectly to secure a sufficiency of foodstuffs, is, broadly speaking, in a normal state of health. The same may be said of the well-to-do classes, who have been able to purchase both native and imported supplies. On the other hand, the high prices obtaining for native products have made it practically impossible for laborers and minor commercial people to secure the necessary supplement to their pro rata of the commission's importations. These classes, comprising something like 5,000,000 people, generally show diminished vitality, although the infants, owing largely to the natural solicitude of the women of Belgium and to the special institutions supported by the relief organization, are really above normal in general health. The improvement in infant mortality, however, has been more than offset by a marked reduction in the birth rate, considered to be largely due to the undernourished and anxious state of possible mothers, and by an increased percentage of imperfectly developed new-born babies, the ill-nourishment of mothers being also responsible here and being further reflected in the curtailed nursing period. In the case of children in the adolescent stage, there is an alarming increase in tuberculosis, due to the lower power of resistance consequent on inadequate diet. It is to correct this serious tendency that the system of school feeding previously referred to is being installed.

This school meal is a matter the commission has very much at heart. It will cost about one dollar per month for each child—say $1,000,000 per month for the 1,000,000 children in need of it. The amount is large, but the commission believes that America will provide it.

Another "Public Buildings" Raid on the Treasury

Our esteemed contemporary *Engineering News* has made the following protest, against the "pork bill" now before Congress, which protest we commend to our readers.

Every engineer knows that the cost of construction work, due to the great increase in prices of labor and materials, has reached an unprecedented level. Under these conditions, private investors and corporations alike are restricting their work to what is absolutely necessary. The N. Y., N. H. & H. R.R. Co., for example, recently issued a circular to all its officers, ordering that not only should no new construction work be undertaken but that maintenance work must be restricted to that absolutely necessary to preserve property from deterioration. Those in charge of municipal work also, in many cases at least, understand the importance of cutting down expenditures at the present time in order that work may be undertaken on a liberal scale when the tide has turned. At that time it will be possible to accomplish far more for a given expenditure and at the same time to give employment to labor, which may then need employment badly.

The Congress of the United States, however, is unmindful of these things. A House Committee has reported a bill appropriating $35,000,000 for the construction of public buildings in the United States and the purchase of sites therefor. The bulk of this money is to be spent for the construction of post-office buildings in small villages scattered throughout the country, many of them places of only 1,000 to 2,000 inhabitants.

The raid on the public treasury known as the Public Buildings bill began a number of years ago in a comparatively modest way; but it has rapidly grown bigger and more dangerous year by year. In the last dozen years something like $190,000,000 has been appropriated by Congress for the construction of public buildings. The pending bill is for about $35,000,000 and is likely to have $5,000,000 to $10,000,000 added to it by the time it passes out of the hands of the Senate. Every one of these Government buildings erected in a country town forms a foundation for demands upon the Congressman by rival towns in the district that similar buildings should be erected to ornament them.

In making the appropriations for these buildings, the scale of expenditure is not at all what is needed to properly accommodate the post-office business of the community, but is merely the sum a Congressman can secure.

This scandal was investigated in 1913 by a Public Buildings Commission which had among its members Secretary of the Treasury McAdoo, Attorney-General Reynolds, and Postmaster-General Burleson. This commission reported that the post-office buildings which the Government had erected in the smaller towns were so extravagant in cost compared with the rented buildings formerly occupied that the operating expenses of the building alone (to say nothing of the interest and depreciation) amounted to three or four times as much as it formerly cost for rent and care when the post office was in a rented building. This waste in public buildings therefore, means not only taking $35,000,000 out of the Federal treasury to construct buildings at a time when building is very costly but that the Government will be placed under a perpetual heavy expense to operate and maintain these buildings.

Congress proposes to undertake this outlay moreover in the face of the report of Secretary McAdoo showing that the United States treasury will face a deficit at the end of the fiscal year of $185,000,000, and at a time when the need was never greater for Government expenditure on projects of real national benefit.

At this time, too, the Government, like every other great business organization, has to face the necessity of increasing wages and salaries to enable those in its service to meet the high cost of living. Bills to accomplish this have already been introduced in Congress, and it has been estimated that absolutely necessary increases of this sort throughout the Government service will increase the nation's expenditures next year by $25,000,000. Surely, under these conditions an insistent demand should be made upon Congress from all parts of the country that the waste of the public funds in the distribution of "pork," either for public buildings or for river and harbor projects which cannot be justified by national need, must come to an end.

Pipe-Line Costs at Present are estimated in the Oklahoma fields at $5000 per mile of 4-in. pipe and $8000 for 6-in.

Filing Survey Data at Mines—I

By R. S. Schultz, Jr.*

SYNOPSIS—A system for filing survey notes, sketches, records, reports, maps, tracings, blueprints and similar data in the office of the chief engineer or chief draftsman at mines. Loose-leaf records and flat filing preferred in most cases. Minute details should be adapted to special conditions. In general, preservation of all preliminary data is recommended.

An engineering force is, or should be, an adjunct to the operating staff of any mine worthy of the name. Some mines require but little engineering work, while others need a large force of skilled engineers. In much the same proportion all mines collect more or less data on various subjects, and the logical place to file these data is in the engineer's office. Systematic filing is most important, but frequently this is not realized by mine managers or even by engineers themselves. Engineers as a class are notably efficient, capable, hard-working men in the field, but it is surprising how often the best field engineers are careless in recording and preserving for future use, the information so laboriously obtained. No filing system can overcome carelessness in recording, but a good one will make accurate recording easier and will preserve such records for future use.

The ideal filing system for an engineer is one that is so simple and efficient that a stranger, with little or no assistance, can find any information on file quickly and without difficulty. The details of any system used must be somewhat a matter of personal opinion and will be governed largely by local conditions. After a number of years' experience under widely varying conditions, I have evolved a filing system which, although far from perfect, is efficient, accurate and sufficiently elastic to meet all but the most unusual requirements. An account of its main features may be of interest to some and of value to others, especially to any who may be establishing such a system.

The data to be filed in the ordinary mine engineer's office cover a wide range, but are readily divided into a few general classes requiring somewhat different methods of filing. In general it may be said that the loose-leaf system will be found to cover practically all requirements. The filing of three general classes of data will be considered.

Survey Field Notes and Similar Material

The first general class comprises such data as survey field notes (both surface and underground), field sketches, cost and performance data, estimates, bills of material, office computations and any other data that can be recorded on a card or sheet not over 5x8 in.; all to be recorded on loose leaves or cards and filed in 5x8-in. card-file drawers, suitably indexed and subindexed.

Survey field notes form the largest division under this class. The usual form of bound survey fieldbook has an advantage in ease of handling in the field, but for filing and ready reference it is not a success, even when separate books, carefully indexed, are kept for each class of work. The loose-leaf form of notebook is being employed more and more extensively for field use. Some dealers handle a line of loose-leaf notebooks and sheets, but most of these are considerably smaller than 5x8 in. This size will be found to make such an excellent note sheet that the purchase of special books and sheets will be warranted. Forms ruled and printed exactly to suit local conditions can be secured at slight additional expense and will prove economical in the long run. The binder is the most important part of the loose-leaf equipment and should be selected carefully to meet conditions peculiar to its use. In all cases it should be covered to protect it from unnecessary wear and dirt. For underground use a rubber cover will be found a decided advantage.

Advantage of the Loose-Leaf System

The loose-leaf system of field notes has the advantage of permitting the field engineer to take with him only such notes as may be required for the work planned for the day. This does away with the useless burden of two or even three notebooks so frequently carried, permits

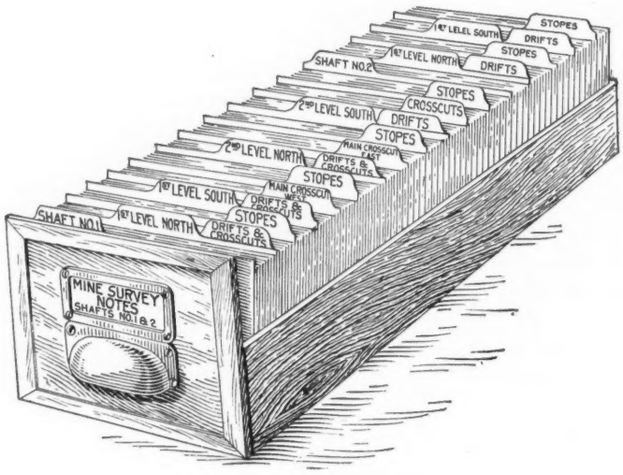


FIG. 1. THE CARD FILE

rapid finding of the desired notes and at the same time leaves practically all field information in the office for use there as may be necessary. In some mines a carbon copy of the field notes is made. This copy, on a sheet of different color to distinguish it readily from the original, is filed as an office copy and is not allowed to be taken from the office, the original being available for field use. In unusually wet mines a sheet of heavy oiled paper, ruled and printed with the survey note form, may be used as a cover and a carbon copy made below. The oiled cover may become spoiled or unreadable, but the carbon copy will remain in good condition. One necessary precaution in wet mines is to have the forms printed with waterproof ink.

Erasures should seldom be made on field notes and should not be permitted after the notes have been recorded. Corrections, alterations and additions made later should show the original figure, lightly cross-hatched but still easily readable, with the correct figure close to

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it, with the initials of the corrector and the date. This rule should apply to all notes and computations and to drawings as well. All survey notes should show the location of the survey, the name of the instrumentman and the date. It is frequently advisable to add the names of the helpers and the make and number of the instrument.

Field notes thus secured should be filed in 5x8-in. card files, suitably indexed and subindexed. Fig. 1 shows the method of indexing to cover part of a mine. In this case, one-third cut index guides are shown. The first cut from the left is used as a main division guide, the second as a subdivision guide and the third as a sub-subdivision guide. Still further subdivision can be obtained by using one-fourth or one-fifth cut guides. It is often advisable to file all notes on one job in special folders similar to the usual form of correspondence folder, with the number of the survey and the nature of the work plainly indicated on the tab.

The loose-leaf system of field notes is especially valuable on large or hurried surveys with the office work following separate from the survey notes. This same rule and method of procedure is applied to the mass of miscellaneous material that gradually accumulates in the engineer's office. A certain amount of care and judgment must be used to avoid filling the files with material of no value, but in case of doubt it is best to file, since the sketch considered worthless today frequently proves of value tomorrow.

Cost data, performance data, time studies, engine tests, estimates, bills of material, etc., should all be included in this class and should be filed by the same method.

It is the custom in many offices for each engineer to have a computation book in which to make his rough sketches and pencil computations. For everyday figuring this is excellent practice, frequently avoiding needless duplication of work and making subsequent checking possible. For computations of permanent value, however, this method is objectionable, as the only person familiar with the contents of any book is the engineer using it. Careful indexing will diminish this objection, but the best method is to record the results of such computations on record

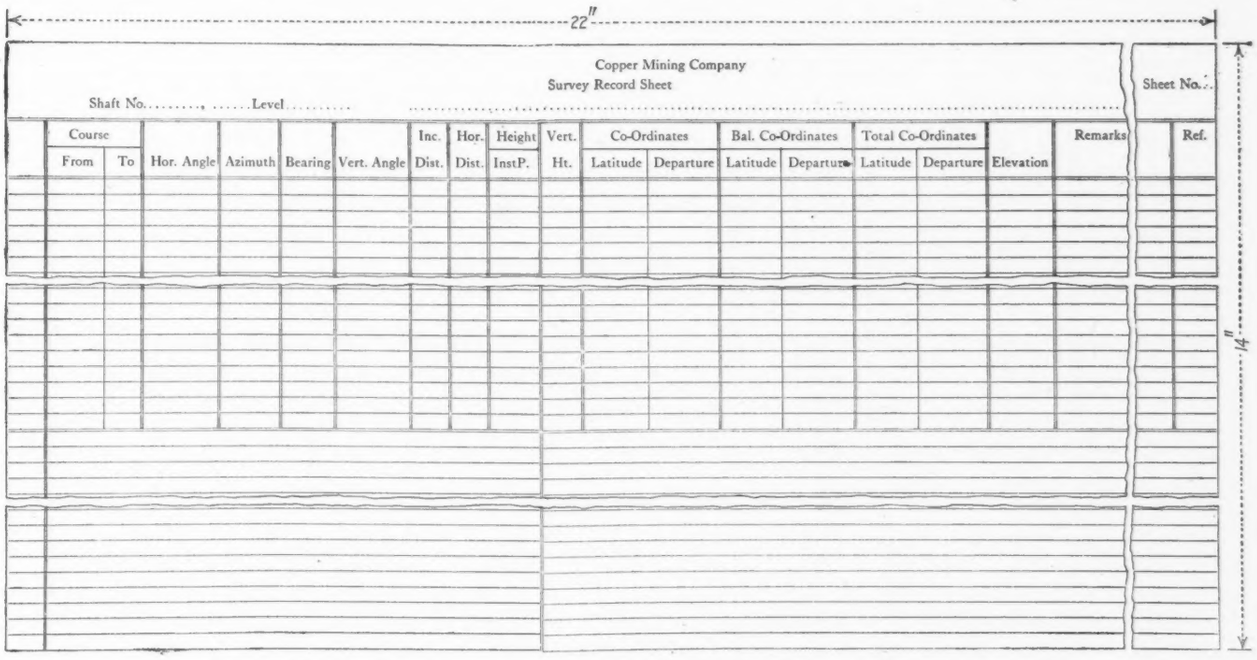


FIG. 2. FORM FOR RECORDING AND FILING SURVEY DATA AND CALCULATIONS

immediately after the field work. On topographic work, for example, it is possible to have the field work of one day plotted by the office force the next day and then to have the plotting checked by the field engineer while still familiar with the lay of the land.

Field and Office Sketches, Etc.

The term "field sketches" is used to designate all rough sketches and computations made in the field, but not necessarily on surveying work. At all mines the engineer is often called upon to design alterations or additions to existing buildings, machines, etc. The preliminary work on such jobs usually consists of freehand sketches on odd pieces of paper, such sketches being used during the job and then destroyed. It is my opinion that all such sketches, no matter how rough, should be available for future reference. It is my practice to make such sketches on 5x8-in. cards and to file them in card files cards to be filed as already indicated. Only the results of these computations need be recorded on the cards, if reference be made to the book and page where the details may be found. Important office sketches should be handled in the same way. This division of the files should be extended to cover all computations, sketches, etc., which are at all likely to be of future use. As described, this section of the files may seem elaborate and so complicated as to defeat its aim of a permanent record readily available for use. In practice, however, intelligent use of the subdivisions of the index will overcome this seeming difficulty and the method of filing will be found to be simple, accurate and rapid.

The second general class of material will include all data too large to record on 5x8-in. cards and sufficiently bulky to require separate consideration for filing. Survey records, weekly and monthly records and reports and similar material will be included. The details of all

such records and reports will depend so largely on local operating conditions and on personal opinion that only the general features will apply to any number of cases.

Under widely varying conditions, loose-leaf filing in ring or post binders will be found entirely satisfactory for both recording and filing. Elasticity and ease of handling are the best arguments for this system and will usually warrant its adoption for this class of material.

Survey records form the most important subdivision of this class, and the only one that will have general application to all mines; varying only in minor details according to the system of surveying employed. These records are the necessary complement of the field notes and should be considered of equal or even greater importance. Many engineers have large, heavy ledgers with special ruling for their survey records, with the computations preserved in the same or separate books; other engineers have smaller books and do not preserve the computations; all engineers will agree that some form of record is necessary. The loose-leaf system has many advantages for these records and has proved satisfactory. It is elastic; it permits classification; it enables several men to work at once; it is of especial advantage in plotting maps, requiring the plotter to handle but a few sheets at a time; it is also economical.

One essential of accurate survey records is the prompt transfer of the field notes. If possible, this transfer should be made by the field engineer or note man, since he is most familiar with the notes. Both the field notes and the office records should show the date and place of the survey and the name of the instrumentman. In addition, reference to the field-note file, the names of the computer and checker and the dates should be noted. Carelessness and inefficiency are sometimes traced by this plan.

It is generally admitted that survey computations should be preserved. Separate books are generally used for this purpose but, at best, are unsatisfactory. The best practice shows the computations with the record. Fig. 2 shows a form used by me. Slightly more than the top half of the sheet is ruled for the traverse record, the bottom being left for the computations. All figuring, no matter how trivial, used in connection with the final record is included on the sheet and is always instantly available for reference. The form shown is 14x22 in., and it should be filed in a special ring binder.

Tracings, Blueprints, Maps, Etc.

Tracings and blueprints form the largest single class of material to be filed in most engineers' offices. An efficient system of recording and filing such material is essential to good work and is of enormous value to all departments of the organization. The engineers' office or drafting room is the natural place to file all engineering data and especially blueprints from whatever source obtained. Some part of the mass of such material is referred to with such frequency that the loss of even a few seconds in finding each print amounts to a considerable total by the end of an ordinary day. Many engineering offices have systems that are both rapid and complete, leaving little to be desired. Many others, unfortunately, fall far short of this perfection with "hit-or-miss" systems which frequently miss.

The variety of subjects covered by the prints in the average mine engineers' office is so great that any system must be somewhat elaborate and care must be exercised lest it become of more importance than the end for which it exists. Local conditions will determine many of the details of any system; certain general features and some details will apply to all conditions.

Whatever system of filing is adopted should be devised with two objects—simplicity and avoidance of duplication—constantly in view. Divided responsibility is a serious pitfall and should be avoided, since it is a cause of carelessness and inefficiency. The entire filing system, including the care of all tracings and blueprints, should be in charge of one man having a thorough conception of the importance of his work and a grasp of the essential features of filing as well as of the details of the system employed. Wherever possible, this man's entire time should be devoted to filing, to keeping the files clear of obsolete material and to supplying the engineers and draftsmen with the latest and most complete information.

Two general classes of drawings are handled in all engineers' offices—those made in the office itself or in other offices of the company, known as "home drawings," and those obtained from other concerns, known as "foreign drawings." These two classes should be kept distinct and separate at all times. In the general class of "home drawings" there are two subdivisions requiring somewhat different treatment.

The class embracing maps and other paper drawings forms a large and important part of the data filed in

Copper Mining Co. Denver, Colo		
Details of Automatic Stop 24"x48" Hoisting Engine Shaft No. 5 Scale ¼" & ½" = 1"		June 21, 1914
Drawn By G. H. Traced By T.H.C. 6/25/'14 Checked By W K.T 6/28/'14 Approved By. C.B. 6/28/'14	No. 1076 File No. 2 Drawer No. 3	Issue No. Original

FIG. 3. TITLE ARRANGEMENT

all mine offices. The great importance of accurate maps of the general workings and of the separate openings, as well as of assay and sample maps, is being realized more and more, until mapping has become one of the most important duties of the mine engineering force. As far as possible, maps should be uniform in size and arrangement, and those covering similar phases of the work should be drawn to the same scale. Considerable latitude must be allowed in this respect, however, since working conditions will largely determine these questions and since the variety in subject and use is too great to permit any hard and fast rule to be set. Where the expense is not prohibitive, all maps should be drawn on the best grades of mounted drawing paper. The method of filing will be determined largely by their size.

Original mine maps are far too valuable to permit their general and constant use. They should be preserved as a final and most accurate record of all openings, to be seldom used except for reference. It is excellent practice, therefore, to have tracings of all mine maps, so that blueprints can be used for all rough work, especially

underground. These tracings should be brought up to date at frequent, regular intervals and so will serve instead of the maps in all but the most important cases. This will also permit the same information to be in the hands of several men at the same time.

Occasionally it will be necessary to make and preserve paper drawings other than maps. Performance, production, time and similar curves, hydrographs, etc., are included in this class. The variety here in size, arrangement, subject and use will be as great as in respect to maps, and in practically all respects the remarks in regard to maps will apply to such drawings. Pencil drawings from which tracings are made are not included in this class, it being generally considered unnecessary to preserve permanently such drawings after tracings have been completed.

Filing Tracings and Blueprints

The value of a thorough filing system will be most evident for tracings and blueprints, and it is for this class of material that such a system becomes essential. The great variety of subjects covered, the constantly increasing quantity of material and the frequent reference to such material make an accurate filing system imperative.

The first essential of an accurate filing system is uniformity in size and arrangement of tracings and the resulting blueprints. I recommend that the tracing be made the determining factor and that all tracings be made uniform in width with variations in length only. A width of 27 in. for finished tracings has been found to have many advantages and with three lengths—40 in. for full-length, 20 in. for half-length and varying lengths over 40 in. for extra-length sheets—will be found entirely practical. The uniform width of tracings will not only greatly simplify filing, but will obviate the danger of small tracings or prints being pushed back in the drawers to be overlooked or lost. The full-length sheet, 27x40 in., is a convenient size for working on the board, for filing and for reference and handling. It is also a manufacturers' stock size for both material and filing devices. This is a considerable aid to prompt delivery on orders and also effects a decided saving in cost over special sizes. Efforts should be made to conform to full-length sheets as far as possible. Special provision is necessary for filing long tracings. Half-length sheets, 20 in. long, will be found a most convenient size and will be used very frequently, but this length should be the minimum on file with full-length sheets.

A sketch-size tracing, about 8½x11 in., is used by many engineers and undoubtedly has its advantages. This size is not recommended, because it should not be filed with the larger sheets and hence requires separate filing devices. The half-length sheet will be found to answer every requirement for small drawings at a slight additional expense. A good general arrangement of a full-length sheet is that in which the title, table of reference and table of changes are placed in the lower right-hand corner, leaving the rest of the sheet clear for use. This makes reference to these tables easy as the tracings lie in the drawer or in a pile. When a bill of material is required, it may be added in the upper right-hand corner.

TABLE OF REFERENCES

Drawing Number	File	Drawer	Classification	Title
654	1	3	Buildings—	Hoist House—Shaft No. 5—Foundation
663	1	3	"	" " — " " "—
500,362	A	6	Engines (Foreign)	Hoisting Engine —Shaft No. 5—Foundation
500,363	A	6	" "	" " — " " —Frame Details
500,364	A	6	" "	" " — " " —Drum "
500,365	A	6	" "	" " — " " —Piping "
500,366	A	6	" "	" " — " " —Arrangement
543	2	3	Hoists	" " — " " 3—Automatic Stop Arrangement
545	2	3	"	" " — " " —Automatic Stop Details

FIG. 4. TABLE OF REFERENCE, 4x6 IN., PLACED DIRECTLY ABOVE THE TITLE ON ALL DRAWINGS

Full-length and half-length sheets should be purchased already cut to size and with the border, title, table of references and the table of changes printed on. This work can be done by the manufacturer or printer at a fraction of the cost of doing it in the drawing room. As the sheets are cut by machine, waste is eliminated and the maximum number of sheets is obtained from each roll. Twenty full-length and one half-length or thirty-nine half-length sheets can be cut from one 24-yd. roll of 30-in. cloth. The ruling and printing should always be done on the side of the sheet opposite that used for the drawing to protect these lines from possible injury or erasure while the tracing is being made.

A double border line should be used, the outer line merely as a trimming line to facilitate trimming the

prints to uniform size, leaving the inner line as a limit of the working space and also to give the print a neat, finished appearance. The cloth should be left full width, except for the selvage torn off the edges. This leaves ample margin for tacking down, for trying the pens and for notes and figures. It also permits the tracing to be remounted for additions or alterations without putting the tacks through the main drawing.

It is to be noted that only full-length and half-length sheets are made up by the printer, extra-length sheets being made up by the draftsman, as required, from a plain roll kept on hand. This requires the border lines, title and various tables to be added by hand, and it will be a most unusual engineer who will not manage to use standard-length sheets in all but very rare cases.

Details of Title Arrangement

A space 4x6 in. at the lower right-hand corner of the sheet is allowed for the title. A typical example is shown in Fig. 3. The title gives a record of the original drawing and, as such, is kept separate and distinct from any subsequent alterations that may be made. It is excellent practice to require the information given in the title to be placed on the detail paper when the drawing is started. This information should be furnished the draftsman by the chief engineer or chief draftsman, who should immediately make a record of it on some form of drawing-record card. This gives a double check on the drawing until its completion, with ample identification. The unfinished drawing may be laid aside at any time for more important work and yet can be taken up again by any competent man without difficulty or time lost in identification. The details of the title explain themselves. The drawing number should be in large, heavy figures to stand out plainly, while the file and drawer numbers should be smaller but still very plain. Many engineers require the drawing number to be placed in two opposite corners of a drawing, the idea being that however a print may lie in a pile the drawing number will always show in the proper corner. The space for issue number is shown as made up by the printer and used for the first printing. When a change is made on

1	7/21/'14	Size and weight of Beam, B-1 Altered	C.T.D.	B.C.B.	7/22/'14	W.L.S.	7/23/'14
No.	Date	Description	Made By	By	Date	By	Date
				Checked		Approved	
TABLE OF CHANGES			Use Latest Issue ONLY Return All Others to Engineering Dept				

FIG. 5. TABLE OF CHANGES, 6 IN. WIDE, RUNNING UP INDEFINITE DISTANCE

the tracing, the word "Original" is entirely inked over and the correct issue number stamped in the corresponding blank space on the prints. It should be observed that for issues subsequent to the original the issue number and the change number will be the same.

Tables of References and Changes

A space 4x6 in. is allowed for the table of references shown in Fig. 4. This table is placed directly above the title, in which position it is quickly referred to, especially in a pile of prints, without removing the print from the drawer or pile. Such a table, properly filled in, will usually obviate the necessity of a cross-reference index. All drawings that enter into the work shown should be given in this table, which should be kept strictly up to date. The column for classification is given to permit grouping of the various drawings referred to.

A space 6 in. wide and of indefinite height is allowed for the table of changes shown in Fig. 5. This table is placed directly above the table of references on the right-hand side of the drawing. These two tables with the title form the part of the drawing that will be referred to most frequently as it lies in the drawer. In the position indicated, this whole information can be referred to quickly by merely turning the corner of the drawings above. The table of changes as printed on the tracing has space for six alterations, but the top

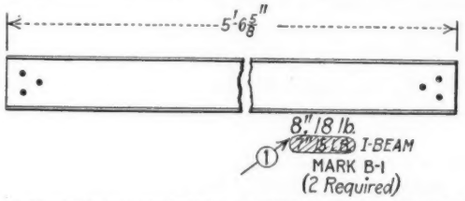


FIG. 6. METHOD OF MAKING ALTERATIONS ON DRAWINGS

line is printed light, permitting easy expansion should more changes be necessary. A complete record of the change is made in the table, and it is quickly found and identified on the tracing by a numbered arrow, as in Fig. 6, showing that beam B-1 in the original issue of the drawing was specified as a 7-in. 15-lb. I-beam. For some unknown reason, it was decided to change the beam to an 8-in. 18-lb. I-beam, the alteration being change No. 1 on the drawing. The table shows that the alteration was made July 21, 1914, by C. T. D., that it was checked July 22, 1914, by B. C. B. and that it was approved July 23, 1914, by W. L. S. In making such an alteration, the original figures should not be erased, but should be preserved for reference, in such form that their superseded character will be instantly evident.

The bill of material, when needed, is placed in the upper right-hand corner of the tracing. A space 6 in. wide and of indefinite depth is allowed for it, expansion being possible at the bottom to suit the necessities of the drawing. As far as possible, grouping by subjects should be used. This bill of material is not printed on the tracing as purchased, but is added by hand in the office when necessary, since many of the drawings made in a mine office will not require such a bill.

[*To be concluded*]

Disposition of the Nickel Output

The *Mining Journal*, London, Dec. 16, 1916, reports that the Solicitor-General for Canada has published a statement to the effect that no nickel has gone from the International Nickel Co. to allied and neutral countries, except with the approval of the British government through the Committee on Enemy Supplies. This official statement was made to allay disquieting rumors in circulation based on reports of trading with Germany. As regards the New Caledonian material sent to America, this was originally permitted only with an undertaking to export an equivalent quantity to France within five months. Since February, 1915, however, the usual arrangement for shipment under special permit, viséd by the French Consul in New York, has been substituted. Reëxport of the metal, either as nickel or alloy, is confined to France, England, Russia and Italy.

Alaska Treadwell-Mexican-United Report

The report of President F. W. Bradley to the boards of directors of the Alaska Treadwell Gold Mining Co., Alaska Mexican Gold Mining Co., and Alaska United Gold Mining Co., as of Oct. 20, 1916, is of such importance that it is given in full, as follows:

Referring to the report of the Consolidated Committee, based upon information as of July 1 last, I have to suggest for your approval and for the information of shareholders the 40-month program herewith submitted, covering operations up to the end of the year 1919, during which period it may not be possible to make any dividend payments.

Before discussing plans for the future, the present condition of the ore reserves and development work should be understood, as they have undergone some changes since July 1.

Treadwell and 700-Foot Mines

The ore-reserve figures submitted with the report of the Consolidated Committee call attention to the allowances that must be made in the ore-reserve calculations, as stated in the last annual reports, because of the sudden shrinkage in assay value that has occurred from the horizon of the 1570-ft. level of the 700 mine extended into the Treadwell mine down to the 2300-ft. level of both mines. In the vertical depth of nearly 700 ft. along the larger portion of the lode channel, no definite orebody has yet been found of sufficient value to leave a profit worth while under present operating conditions. The figures for the Treadwell ore reserves, as of Dec. 31, 1915, were based on accepting as profitable the tonnage in the block lying below the 1750-ft. level and above the 2100-ft. level, because of the evidence disclosed by the development work as completed in this block to Dec. 31, 1915. For example, No. 2 west drift, on the 2100-ft. level, gave an average assay value of $3.34 for its entire length of 400 ft., while the main crosscut on the boundary between the Treadwell and 700-Foot claim gave an average assay of $3.13 for a width of 150 ft. Later the corresponding crosscut on the 2100-ft. level at the Mexican-700-Foot boundary gave an average assay of $2.70 for a width of 80 ft. Therefore the usual method was followed of preparing for stoping with all the necessary chute and manway raises, the intermediate drifts and the cutting-out work; but upon starting the stopes, it was ascertained that the assay values indicated did not extend far above the level itself, and it will be necessary to abandon the stopes started in the Treadwell mine above the 2100-ft. level. However, this preparatory stope work on the 2100-ft. level is still being continued in the 700-Foot mine with the hope that there the stopes may be confined to certain indicated streaks good enough to be classed as ore, in the effort to obtain some return for the expenditures that have been made in opening up the level. A further disappointment, was the 1950-ft. level, which was extended over what was considered to be the 2100-ft. level stoping area in order to provide the necessary ventilation connections. On this 1950-ft. level the 290 ft. of driving in Treadwell ground has an average assay value of but 65c. Also the assays on the 1750-ft. level, Treadwell, are all below normal, having gradually decreased from the good value on the 1600-ft. level to poor value at a horizon of about 50 ft. above the 1750-level. So it is now demonstrated that there is no improvement until a horizon is reached slightly above the 2100-ft. level.

The average assay value of all the 2100-ft. level work up to this date is $1.85 in Treadwell ground and $1.64 in 700-Foot ground. This means that the additional development work done since July 1 has reduced to $1.70 the average assay value for all the area so far opened out on this level; nevertheless, as already mentioned, it is hoped that stoping on this level in the 700 mine may be restricted to profitable streaks. On the other hand, the average assay value along the 2300-ft. level, to date, is $2.12, a substantial improvement over the 2100-ft. level and an indication that nearly the entire block of ore between the 2300- and 2100-ft. levels may eventually be worked at a profit.

The work on the 2300-ft. level has also demonstrated that the pay-ore has a flatter trend in depth to the eastward or into the 700-Foot ground below the 2100-ft. level than it had above. That is, all the profitable portion of the lode has apparently passed into 700-Foot ground at the 2300-ft. level, as, so far, no profitable orebody has been found in the Treadwell ground on this level.

Setback of Treadwell Mines

The poor zone as described may at this time be considered as having put the Treadwell mine back five years, with no prospect of ore in its ground below the 2300-ft. level, unless the barren Starr dike on its downward trend to the westward should push the "ore dike" or "pipe" back into Treadwell ground; and it may also be considered as having put the 700-Foot mine back eight years, but with the definite prospect of a profitable grade of ore below the 2300-ft. level.

Because of this handicap, the Treadwell has had to draw very heavily upon its supply of broken and caved-pillar ore from upper levels; and as a consequence, on July 27 last, surface evidences of a subsidence near the Treadwell-700-Foot boundary on the shore of Gastineau Channel began to be manifest. It was therefore deemed advisable to discontinue this heavy drawing in order to protect the future of the Treadwell, 700-Foot, and Mexican mines; and this decision resulted in the shutting-down of the 240 mill and one-half of the 300 mill on Aug. 1, last.

In view of all these disappointments, the sinking of a number of diamond-drill holes below the 2300-ft. level has been started in order to reëstablish confidence. The first of these holes is now down 525 ft., with an average assay value of $2.33 per ton; and indications are that it has cut the foot wall. This hole starts from the hanging-wall end of the main crosscut near the Treadwell-700-Foot boundary on the 2300-ft. level and was pointed to reach the foot wall at the 2300-ft. level in about the center of the 700-Foot ground. If it has now cut the foot wall, it has done so at 40 ft. below the 2700-ft. level, making the right-angle thickness of the ore so cut 271 ft., with an average assay value 30c. below the past average assay of the Treadwell-700-Foot-Mexican ore dike. The average assay of this dike has been $2.63, with a yield of $2.42 from its average area of 168,000 sq.ft. Therefore, if this first drill hole be a fair sample, the expected yield from the ore between the 2300- and 2700-ft. levels cannot exceed much, if any, over $2 as

against the past average yield of $2.42. However, the other drill holes now sinking and to be sunk may change this expectation for better or for worse.

The sinking of the Central shaft has now been completed for the 2500- and 2700-ft. levels; and crosscuts, which should reach the lode channel by next May, will be started at once for opening these two levels. The Combination shaft and 2100-ft. level will be connected by the end of the year, and these should afford, together with an incline now being sunk in the Mexican ground below the 2100-ft. level, a complete service and ventilating outlet for the stopes on the 2300-, 2500- and 2700-ft. levels. These stopes should then yield, at 70% extraction, 5,880,000 tons of ore.

In the Mexican mine, on the 1750-level, the ore dike, as opened, justified work preparatory for stoping; but as soon as the cutting-out was well under way, it became apparent that here, just as on the 2100-ft. level of the Treadwell, the indicated values did not extend far above the level proper, and the work had to be abandoned. This indication of ore on the 1750-ft. level, together with the early promising values on the 2100-ft. level, led to the belief that there was a gradual improvement from the 1750-ft. level down. Therefore stopes were also cut out on the 2100-ft. level on assay values that justified the work, but in rising, the ore became too low-grade.

So, on Dec. 31, 1915, there was ample evidence and justification for the statement made concerning the ore reserves in the Mexican mine; but subsequent development work and the abandonment of stopes started on both the 1750- and 2100-ft. levels in Mexican ground, demand that these estimates also be modified.

On the 2100-ft. level, the lode at the 700-Mexican boundary is 130 ft. wide with an average assay of $1.75, while on the 2300-ft. level it is 65 ft. wide, as tested to this date, with an average assay of $1.02.

The present influence of the barren Starr dike seems to be one of pushing the ore-bearing dike out of the Mexican ground. If this is a correct interpretation, the ore dike should eventually be found again in Treadwell ground; but if not, the ore dike should continue on its downward and eastward trend, and all of it should have left 700-Foot ground and be in Mexican ground at the 3900-ft. level.

There has so far been no disturbing influence against the Ready Bullion ore-bearing dike. The bottom, or 2400-ft., level (corresponding to a 1980-ft. level on the Treadwell mine) has, up to date, cut across the orebody for a width of 50 ft. with an average value of $1.92; and the foot-wall drift has been advanced 120 ft. with an average value of $5.53. The past average assay value of the Ready Bullion ore dike has been $2.66 with an average yield of $2.08 from its average area of 43,800 sq.ft.

Surface Subsidence and Water Conditions

Appended is a report by Livingstone Wernecke, mine geologist, covering all the details in connection with the surface subsidences, the movement at the central hoist, the movement in the Central shaft and the inflow of salt water. The summary and conclusions of this report demonstrate that all these matters are under absolute control. This is due to the forbearance of the Treadwell company in curtailing its mining and milling operations so as to withdraw slowly and gradually its stock of broken and caved-pillar ore reserves without doing any further damage to the mines. Therefore, all these causes for anxiety may be considered as removed as long as the past harmonious relations between the three companies continue.

Forty-Month Program

Appended hereto is a complete detailed schedule covering all operations of all the companies up to the end of the year 1919, as prepared by the general superintendent, R. G. Wayland. It is to be noted that this 40-month program is based on obtaining a no higher yield per ton from the 700-Foot mine than has so far been indicated by the 2300-ft. development work.

If the additional diamond-drill holes now being sunk justify the complete carrying out of this schedule, the condition of the companies at the end of 1919 should be as follows:

The Combination shaft should be completed to the 3600-ft. level and be equipped with a new hoist, capable of hoisting 5000 tons per day from the 4200-ft. level. This would be an electric hoist with complete equipment of head-frame, crushers and all other accessories, and with the necessary addition to the Central electrical power plant. The Combination shaft would also be equipped with twice the pumping capacity of the pumps in the present Treadwell shaft, which would be held in reserve.

All openings from present workings to both the Combination and Central shafts would be closed by air-tight bulkheads so as to make the Combination shaft a downcast and the Central shaft an up-cast for all future ventilation. An effort will be made to have these bulkheads also water-tight; so in case there should be any increase in the flow of water into the present workings, it could be kept out of all the new and deeper workings.

The cost of all the foregoing and the minor additional construction program (all of which is listed in the appended schedule) will amount to an average of about 15c. per ton of ore milled during the period, being 2c. per ton less than the average cost of construction work in the past. Therefore, if the program goes through and with fair luck, the several companies should, at the end of the year 1919, have paid for their respective shares of all this work and be in the following financial condition:

Treadwell Company: $845,800 added to all its present net assets, making its total net liquid assets	$2,127,000
Mexican Company: $92,400 added to all its present net assets, making its total net liquid assets	250,000
Alaska United Company: A loss of $184,700 in net assets, but with a gain of $960,000, represented by that amount of Ready Bullion and 700 profits tied up in broken ore ready and available for milling, making its total net liquid assets	$775,300
Total	$3,152,300

It is evident that a smooth working out of this program would be assured by consolidation.

Future Prospects

If the properties are consolidated, if the orebodies continue down to the 4200-ft. level, of past average size and value, if the temperature at the 4200-ft. level does not exceed 95° F., and upon the further assumption that stoping can be done upon the basis of leaving 50% of the orebody as pillars and of finally extracting 50% of the pillars so left, the consolidated property should, beginning at the end of the year 1919 and for 16 years thereafter, be able to mill 1,750,000 tons annually at an average profit of 75c. per ton. In addition, the consolidated

company, beginning with 1920, should have net liquid assets as follows:

Left of present bonds	$349,000
Left of present net liquid assets	489,800
Mercantile and operating supplies	600,000
Ready Bullion and 700-Claim operating profits tied up in accumulating stocks of broken ore	775,300
Treadwell operating profits in cash	845,800
Mexican operating profits in cash	92,400
Total	$3,152,300

Past earnings of the three companies have averaged 87c. per ton, 77c. of which has come from mining and milling ore and 10c. from other sources.

Consolidation

Pending the effort to consummate consolidation, it has been arranged to guard each company's interests in the following manner:

1. Each company to pay its own direct expense involved in mining and milling its own ore. In case it becomes desirable for one company to lease an available or idle plant of either of the other companies, the monthly rental to be paid in such case to be $\frac{1}{12}$ of 10% on the valuation of such plant as listed in the Consolidated Committee's report.

2. Each company to pay its share of any additions to the present 60-20 and 20% joint utilities; and each company to receive monthly $\frac{1}{12}$ of an annual charge of 10% (as interest and redemption) on its investment in the several utilities that have been jointly erected in the course of years by a participation of 60% on the part of the Treadwell company, 20% on the part of the Mexican company and 20% on the part of the United company.

3. Beginning as of July 1 last, and hereafter, the Combination shaft, its hoist and all similar combination expenditures to be participated in by the Treadwell company, 54%; by the Mexican company, 12%; and by the United company, 34%, on the consolidation basis recommended by the Consolidation Committee. It is fair that each company should also receive monthly $\frac{1}{12}$ of 10% on its expenditures for the Combination utilities, because an annual return of 10% for 16 years will suffice to repay such expenditures with approximately 6% interest.

4. All general expenses common to all three companies to be absorbed by being spread over each dollar spent by each company on the above-mentioned first, second and third items.

An effort will be made by the consulting engineer, P. R. Bradley, and the local organization, to secure new mining properties in the territory tributary to Douglas Island. Only such propositions will be considered as can be financed within the resources of the three companies and then on the recommended consolidation ratio of 54-34-12%.

The accumulation of liquid assets during the 40-month period, September, 1916, to December, 1919, is not for the above purpose solely, but is to provide against contingencies and accidents and also to provide for a combination mill, cyanide and compressor plant, in case consolidation is effected, and also in case sufficient ore is thereafter developed to justify the necessary capital expenditure.

Such a general combination plant would cost about $800,000, but it would make an increased saving in extraction and a reduction in operating costs totaling about 20c. per ton.

[The surface caves and the appearance of salt water in the underground workings, mentioned in the president's report were made a special subject of investigation by Livingstone Wernecke, the mine geologist. The account of this investigation occupies 65 pages of the report and includes several tables and maps. The summary and conclusions follow in full.—Editor.]

Summary and Conclusions

The surface subsidence between the Mexican and 700-Foot mills, which appeared in 1913, was preceded by caving of the stopes in the Mexican mine. A basalt dike with a decided fault, which cuts this ground diagonally to the strike of the slates and orebody, has formed a line of weakness by which the caving reached the surface. No undiluted salt water reaches the mine in this vicinity. The salt water seems to be diluted with an equal volume of fresh water, and to have traveled some distance through water-courses.

The surface subsidence in the vicinity of the Treadwell Club, Natatorium, Central hoist and 700-Foot mill is connected with the movements in the immediate bedrock.

The stopes in the Treadwell mine below this subsiding area are full of caved ore and caved waste, as far as can be determined by inspection. Some débris from the pit has been drawn with the caved ore from chutes on the 1459-ft. level and above. Greenstone and schist from the hanging wall has been found in chutes on the 1600-ft. level and up. Underground investigation show that all pillars in the vicinity under consideration have been crushed. Some on the 1250- and 1050-ft. levels were mined so they would cave. Those at 1450 and 1600 ft. caved without assistance, and some of those at 1750 ft. crushed while the stopes were full of broken ore.

A reasonable conclusion from the foregoing facts is that the weight of overlying rock has broken the hanging wall and it is resting on the caved ore and caved waste. This is particularly likely to be true along the flat dips, and at the change from a steep to a flat dip, which forms a sag in the hanging wall. Part of the waste is from the glory-hole, and part from the hanging wall.

Air-blasts, or the caving of rock with explosive violence from some internal or molecular strain, have produced a peculiar caving phenomenon from the backs of some stopes and the faces of some drifts, but undoubtedly this is not the cause of the intense shattering of pillars previously noted.

The backs of crosscuts and drifts are supported by an invisible arch-ring in the rock, the shape of which depends on the elastic properties, broken or fractured condition of the rocks, the dip of the formation, and the weight of overlying rock. The amount that the axis of this arch-ring is inclined from the vertical depends on the dip of the formation. The backs of the stopes are supported by an invisible vault, which depends on the same properties of the rock as the arch-ring. The inclination of its axis also depends on the dip of the formation. If all the stope pillars are shattered, it is reasonable to believe that the fissile and broken condition of the slate, the steep and variable dip, the variable elastic properties of slate, diorite and greenstone and the crosscutting dike-fault make an immense vault to span the entire area an impossibility.

By taking the quantity milled from the caved vicinity as 6,220,000 tons, and assuming that two-thirds of the remaining pillars have caved, 1,500,000 tons to have come from the several pits, and 4,440,000 tons from

the pillars and level-bottoms above, and assuming all rock to expand one-third on breaking, there remains a space of 35,600,000 cu.ft., which is probably filled with caved material from the hanging wall. If the hanging wall also expands one-third, 106,800,000 cu.ft. must cave to fill that space. This volume taken in the form of an elliptical cone, 600 by 800 ft. on the base, will be 900 ft. high. The apex will be 400 ft. or more below the surface.

The axis of this theoretical cone will be inclined approximately 20° from the vertical toward the northeast and will intersect the 700-Foot dike-fault. It is reasonable to conclude that the slate has broken along this crosscutting line of weakness and reached the surface, where subsidence has taken place.

The 700-Foot mine dike-fault, which is similar in every way—except the one difference mentioned below—to the Mexican dike-fault, was first noted in May, 1913, on the 990-ft. level of the 700-Foot mine. A severe cave followed in October, 1913, in the stopes in the vicinity, from the 1320- to the 880-ft. level. This was the origin of the present subsidence, which, after being augmented by further caving in June, 1915, in the Treadwell mine, reached the surface in July, 1916. The 700-Foot dike-fault differs from the Mexican dike-fault in that undiluted sea water flows along or near it and enters the Treadwell mine on the 1600-ft. level. The analysis of this water compares favorably with the water of the shores of the Gastineau Channel, 15,000 parts of solids per 1,000,000.

Three other varieties of water and their several mixtures can be recognized in the Douglas Island mines: (a) Water from the surface which varies in amount and concentration from each heavy rain. Its principal salts are sulphates. (b) Meteoric-vadose water, which has a comparatively low concentration, and a constant flow from seams and bore-holes on the foot-wall side of the orebody. (c) Marine-vadose water, which has not so far been found pure, but always more or less diluted with meteoric circulating water. This mixture has been found in seams and bore-holes in the hanging-wall side of the orebody. Its concentration is high for mine water and flow very uniform.

Comparing the several water analyses with those of other mines, it can be safely concluded that Gastineau Channel has a decided influence on all water in the rocks below, and that more sodium chloride can be expected in the water from the Douglas Island mines than in those from inland mines.

The weir record, with some allowance for salt water in mixtures, shows a flow of 100 gal. per min. of salt water into the Treadwell mines. The pump records show that the total flow of water into the Mexican, 700-Foot and Treadwell mines was for:

Year	Months	Gallons	Gal. per Min.
1916	8	133,334,000	379
1915	12	179,503,000	340
1914	12	175,878,000	334

The above record is an increase of 39 gal. per min. in 1916 and 7 gal. per min. in 1915, assuming a uniform yearly rainfall. The following amount of water was lifted from the Ready Bullion mine in the same periods:

Year	Months	Gallons	Gal. per Min.
1916	8	32,590,000	92.8
1915	12	51,280,000	97.7
1914	12	54,232,000	103.0

Allowing for a slight variation from rainfall, the flow of water in the Ready Bullion is constant. If the pump records are correct and the increase was all salt water, 54 gal. per min. of salt water was entering the Treadwell mine prior to 1914. The increase of 39 gal. per min. in 1916 is undoubtedly a result of the surface subsidence and caving along the 700-Foot dike-fault, which was first noticed in July, 1916.

The following reasons lead to the belief that the 700-Foot dike-fault is the controlling factor in the surface and flow of salt water:

a. The subsidence is along the projected outcrops of the dike-fault.

b. With due consideration being given to the effect of dip and unequal elastic properties of the rocks, the sinking area is not symmetrically situated over the caved stopes of the mine.

c. By taking the volume of the ore milled, and making reasonable assumptions (summarized above) concerning the caved filling from pillars, level bottoms and hanging wall, the broken hanging wall would expand and fill the space when approximately within 400 ft. of the surface.

d. The salt water that enters the mine begins vertically down the dip from the dike-fault and the shore line of Gastineau Channel, and is found westward along a watercourse. Meteoric-vadose water is found eastward.

e. It is much easier to believe that the caving would be along an old fault or gouge seam that has destroyed the tensile and shearing strength and lessened the compressive strength than to believe that entirely new cracks and seams have been formed in near-by rocks. The above is not to convey the idea that no new cracks have formed. Some have been recorded, and others must have formed to accommodate the surface movements, but all are near or leading to the 700-Foot dike-fault.

The point that may be against the 700-Foot dike-fault being the controlling factor is that, where observed on the 1600- and 1750-ft. levels, it is practically dry. The water enters the mine through a slip, or smaller fault, which must intersect the dike-fault in or about the greenstone. This slip does not extend far along its strike into the slates, and is considered not to extend far along its dip into the slates.

Careful Ore Drawing Will Prevent Flood

The consensus of opinion of the mine staff, and a reasonable conclusion from the above facts is, that further drawing of caved ore will cause more surface subsidence and a small increase of salt water, but if this drawing proceeds with caution and all indications are carefully watched, no disastrous flood of salt water will follow.

Four preventive measures have been suggested: Bulkheading each level near the Combination shaft, drawing the available caved ore, and letting the upper part of the mine fill; filling all open stopes above 1750-ft. level with tailing, to prevent further caving; prospecting for the dike-fault at the surface, and building a coffer-dam on bulkhead to exclude all sea water and fill with tailings; and fill 300 ft. or so into Gastineau Channel from the present shore line with tailings to exclude a part of the sea water and prevent any possible flood of sea water. The last is being done at present, which with careful drawing of caved rock should minimize the probable dangers.

The Mexican dike-fault reaches the 2100- and 2300-ft. levels, but no danger can be attached to its presence if

a substantial pillar is left between the 2100- and 1750-ft. levels, and no extraordinarily large stopes are made. The increasing depth should lessen the possibilities of an inflow of salt water on those lower levels.

Generalizing from the preceding, it can be said that although the total quantity of water pumped from the Treadwell mine is small compared with some mines, 27% of it is salt water from Gastineau Channel, which, with the surface subsidence near the shore along a line of structural weakness, is sufficient to indicate a serious future condition if the drawing of ore had continued at the old rate of 1,000,000 tons per year. This condition has been temporarily eliminated by decreasing the amount of ore drawn, and can be permanently eliminated by any one of the methods outlined.

Combinations To Conserve Natural Resources

WASHINGTON CORRESPONDENCE

That the business interests of the country are in favor of combinations to conserve natural resources is indicated by the preliminary count of the votes cast in a referendum just taken by the Chamber of Commerce of the United States, Washington, D. C. Four hundred and thirteen commercial organizations, each entitled to from one to ten votes according to membership, participated in the balloting. All but four states were represented.

There were 1034 votes in favor as against 110 opposed to the report of a special committee of the National Chamber which recommended that there be remedial legislation to permit coöperative agreements under Federal supervision in those industries which involve primary natural resources, on condition that the agreements in fact tend to conserve the resources, to lessen accidents, and to promote the public interest. According to Elliot H. Goodwin, the General Secretary of the National Chamber, the referendum will come up for discussion at a meeting of the Board of Directors on January 30, at which time the vote will be canvassed.

The plan thus endorsed would make it possible for the Federal Trade Commission to go beyond its present powers of investigation and to formulate constructive plans under which an industry may operate to the common benefit of consumers, workmen, and producers. The committee whose report was voted upon endeavored to point out a way by which the public interest might be safeguarded and promoted instead of being left to take care of itself, as at present. The recommendation is confined to timber, the ores, and deposits of useful metals, and deposits of minerals which are a source of heat, light and power.

The report of the committee of which W. L. Saunders, of New York, chairman of the Board of Directors of the Ingersoll-Rand Co., and formerly president of the American Institute of Mining Engineers, is chairman, also advocated increased safety for workmen. It was contended that in the course of the last 25 years the danger in industries to life and limb has grown in breadth and intensity. The report even went so far as to say that in the United States each year there are about 25,000 deaths resulting from industrial accidents. In three industries—metal mining, coal mining, and lumber—with 1,400,000 employees in 1913 the number of fatalities was said to be almost exactly the same as among railway employees, although there were 300,000 more railway employees.

In the proposed legislation due attention would be given to property loss and the prevention of material waste. Statistics were presented in the National Chamber referendum which declared, for instance, that only about 35% of the total volume of lumber as it stands in the forest now reaches the ultimate consumer, most of the remainder being wasted. The Director of the Bureau of Mines was quoted as saying that something in the neighborhood of 40% of the coal in the seam is lost so far as beneficial utilization is concerned. It was pointed out that millions of barrels of oil were lost and a condition equally as bad existed in connection with natural gas and many other natural resources.

In putting forth the question submitted in the referendum, the committee developed the idea that any legislation enacted by Congress would in itself have limitation, because Congress can do no more than deal with interstate trade. The committee had in mind remedial legislation which would in no sense encroach upon state jurisdiction, but which, when these enterprises through their entrance upon interstate trade become subject to Federal statutes, would declare legal the situations that are in question in the event that certain conditions have been met.

The form which remedial agreements among individual operators in the industries under discussion should take the committee did not undertake to suggest. It recognized that different industries may well require distinct forms of agreement. Thus by raising the question of a definite national policy for utilization and conservation of resources to which manufacturers generally must look for raw materials or fuel, the legislation advocated in the referendum would be of vital interest to consumers, producers, and operators.

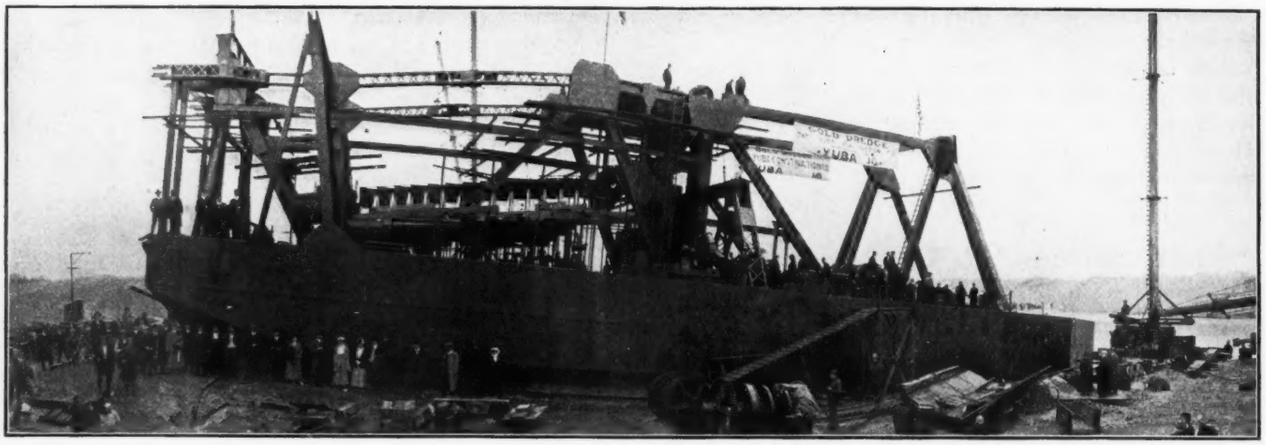
The Annual Meeting of the Institute

The 114th meeting of the American Institute of Mining Engineers will be held at New York, Feb. 19 to 22, inclusive, 1917. The program will include the usual technical sessions, at which papers on mining and metallurgical subjects will be presented. In addition, there will be a program of more general interest.

On Monday, Feb. 19, there will be technical sessions in the morning and afternoon. At night there will be a Reunion Smoker at the Engineering Societies' Building, which everyone is urged to attend. Appropriate entertainment will be provided in abundance. Special tables will be arranged to provide for all who attend, and light refreshments and "smokes" will be provided. On Tuesday, Feb. 20, besides the technical sessions, the annual dinner will be held at the Hotel Astor. Dancing will follow the dinner. On Wednesday, Feb. 21, technical sessions will be held morning and afternoon, and at night there will be an entertainment and lecture at the Engineering Societies' Building. Thursday will be given over to an all-day excursion by special train to West Point, where the United States Military Academy will be the attraction.

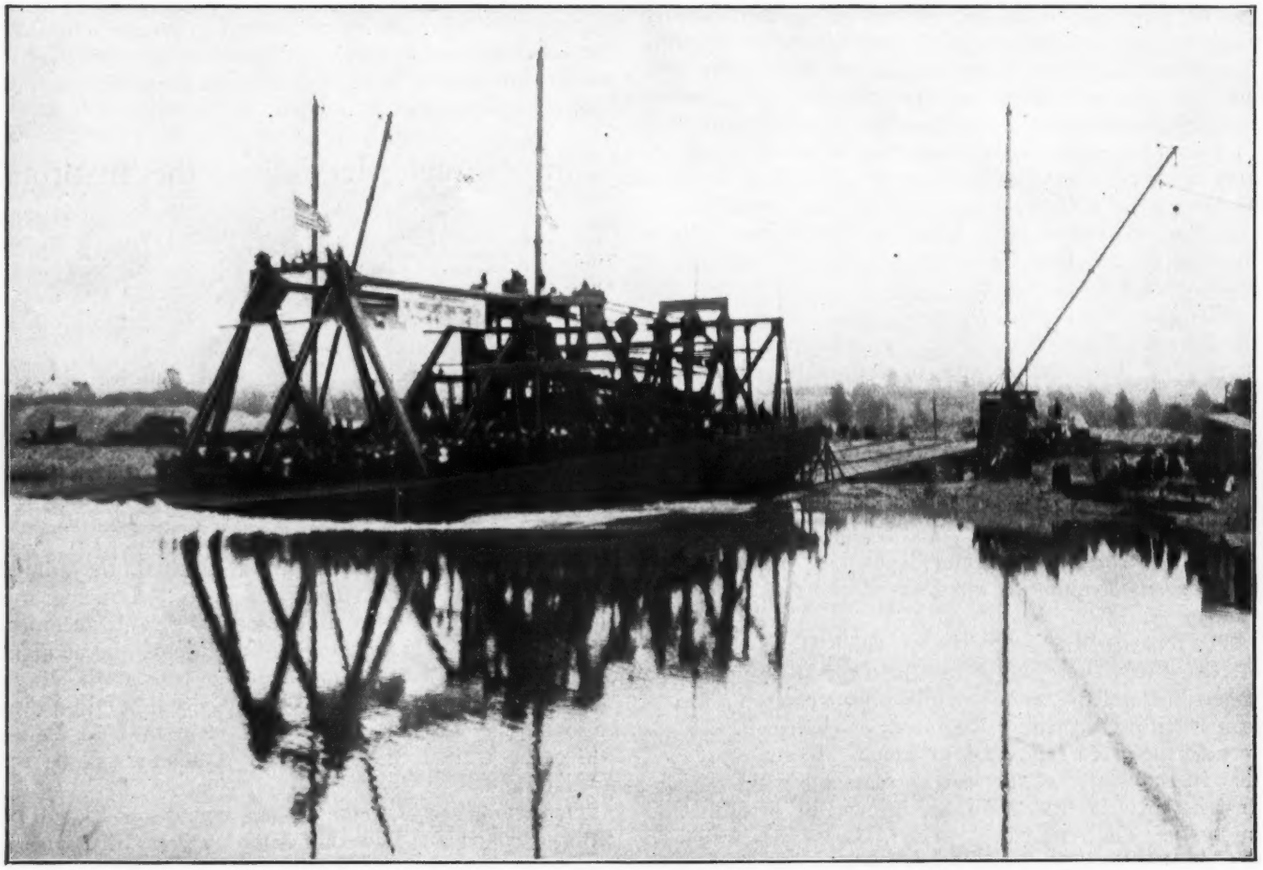
The committee of arrangements consists of David H. Browne, chairman; Lawrence Addicks, Percy E. Barbour, George D. Barron, Karl Eilers, Louis D. Huntoon, H. A. Megraw, Thomas T. Read, Burr A. Robinson, F. T. Rubidge, E. Maltby Shipp, Bradley Stoughton, Edward B. Sturgis, Arthur L. Walker.

Photographs from the Field



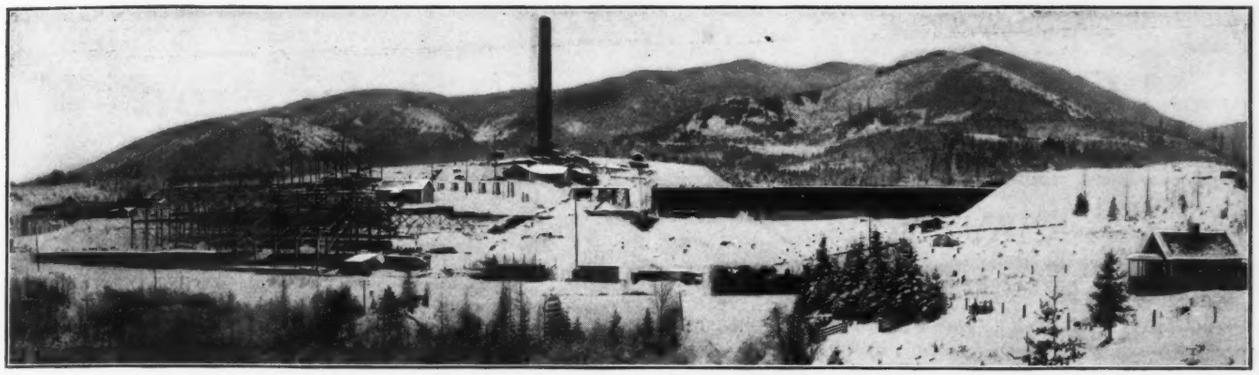
STEEL HULL AND FRAME OF SUPERSTRUCTURE, YUBA NO. 16 GOLD DREDGE

Yuba No. 16 dredge on the ways, awaiting the whistle signal that was to start California's greatest gold dredge into the water. First steel was laid on Sept. 20, 1916; hull was ready to go into the water in 37 days



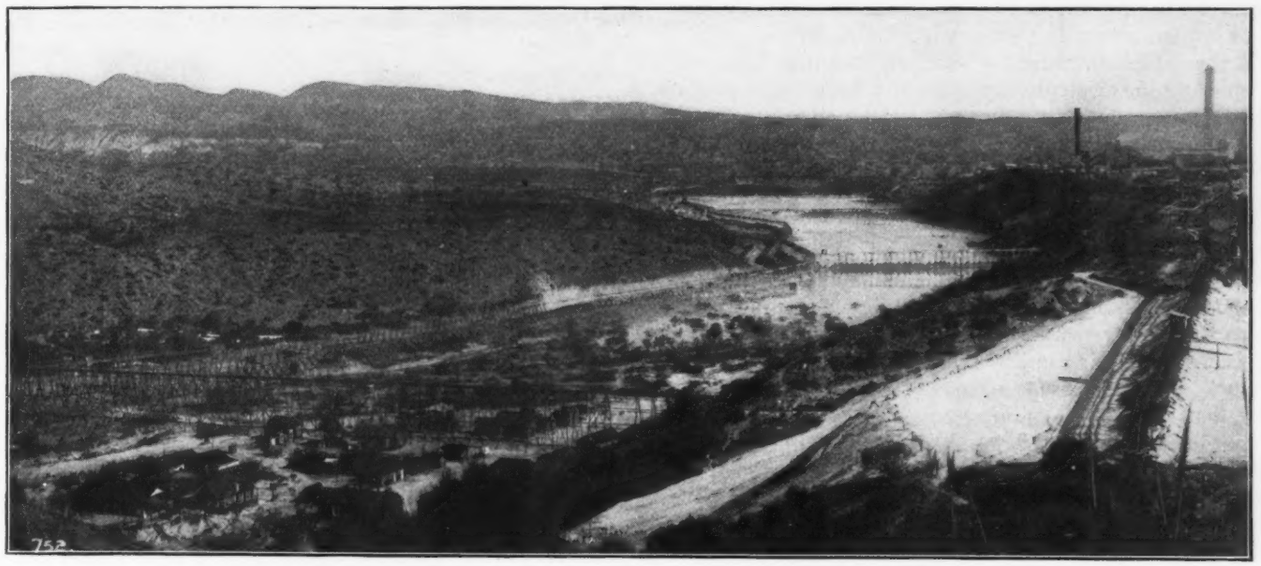
LAUNCHING OF YUBA NO. 16 ALL-STEEL DREDGE IN YUBA RIVER, NEAR HAMMONTON, CALIF.

Yuba No. 16 dredge taking the water at 3:30 p.m. on Nov. 26, 1916. About 200 people were present at the launching, which was successfully accomplished, the steel hull entering the water without a hitch of any kind

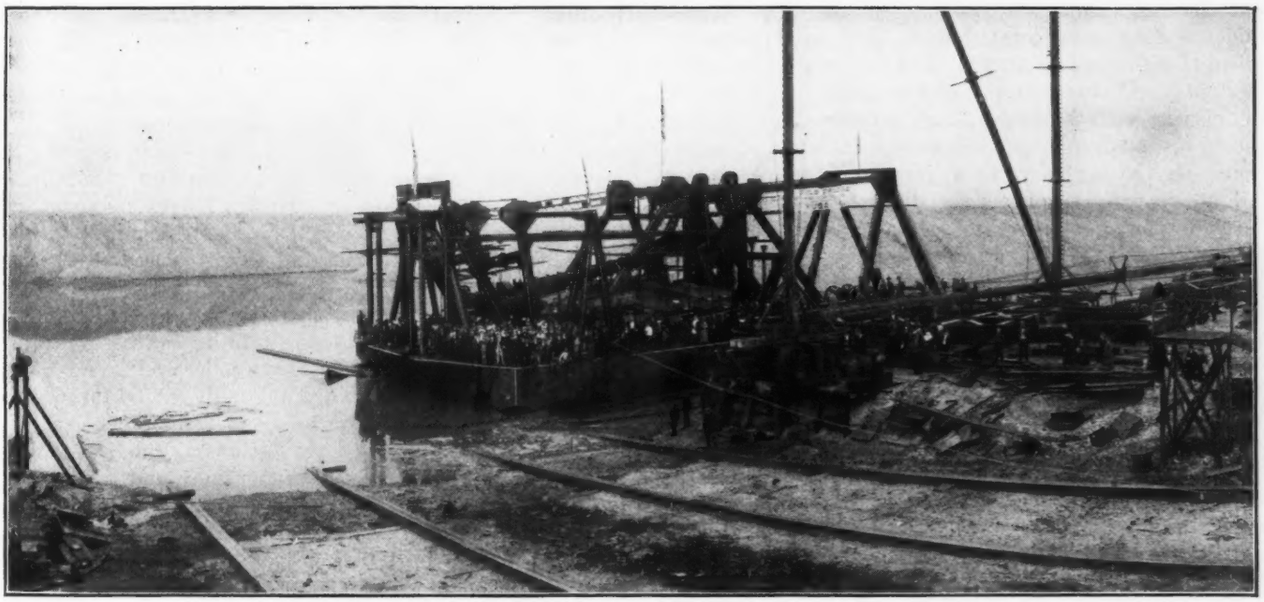


PROGRESS AT BUNKER HILL & SULLIVAN LEAD SMELTERY, KELLOGG, IDAHO

This view of the new lead-smelting works at Kellogg, Idaho, was taken on Dec. 13, 1916, and shows the stack and the furnace building well along. The plant is expected to blow in about Mar. 15, 1917



TAILING STORAGE AT INSPIRATION CONSOLIDATED, MIAMI, ARIZ.



YUBA NO. 16 DREDGE ALONGSIDE AFTER LAUNCHING AT HAMMONTON, CALIF.

This all-steel gold dredge is to be slightly heavier than Yuba No. 15, which weighed 2300 tons. It will have two tailing stackers to place the tailing on both sides of the Yuba River and thus reclaim the channel. The dredge will have 16-cu.ft. buckets and is designed to dig 80 ft. below water line. It was designed and built by the Yuba Construction Co., of Marysville, Calif.

Correspondence and Discussion

"Wildcats"

The editorial on the subject of "Wildcats," which appeared in the *Journal* of Dec. 23, 1916, p. 1110, was of such great interest to me that I have ventured to put forth some few remarks on the same subject.

Despite the fact that many men of considerable reputation have gone over the ground, it may still not come amiss to have one more opinion, especially as I have had the pleasure of trying to fight for a proposal in Canada, that I imagine might do some good.

I cannot altogether agree with the underlying attitude of the editorial, which I read as meaning that while deploring the existence of a state of fraudulent promotion, little can be done to remedy it because the fault is that of the general public. In my opinion the problem is how to save the public from themselves. The present position, where there is on the one hand the mining public saying, "If the people wish to gamble and make fools of themselves, let them do so," and the general public, which says, "There is a fortune here, I will take a chance on it," shows the mining man as playing only a passive part in the drama. He is inclined to let things drift because the getting at any remedy appears to be a forlorn hope. But consider for a moment the injury that is done by that attitude to mining in general, to the development of mining countries and to the financing of projects direfully in need of help, and lastly, its effect on the investing public. If the effect of this attitude can be visualized, I feel sure that it will be abandoned promptly.

Part of my life has been spent in various mining districts in different parts of the world that are comparatively remote from financial centers, and perhaps in such mining camps the "wildcat" promoter is more in evidence that elsewhere; but I have been impressed strongly with the fact that it is an extremely easy matter to "put over" propositions of this sort. Furthermore, astonishing as it may seem, such proposals are not engineered or based upon new discoveries, a new field or new veins; on the contrary, there is a considerable class of mining ventures as old as the district itself, but which have the power of recurring year after year. There are "mines," if they can be called such, in this district, whose owners appear regularly in the spring with fresh capital extracted from American pockets, and who depart in the late fall shorn and bedraggled, and who have continued in that condition of recurring affluence for 20 years and over. If it is simple for a certain class of country promoter to do that, it stands to reason that it should not be difficult for a first-class man in this line of business to gather in considerable sums of money. This gives one sidelight on how much money must be thrown away on useless quests.

Turn now to the investor's side. Take the case of my father, as a typical instance—a professional man (an artist) with works scattered in American and many well-known Continental galleries, and a man well known in his own line of business, but, of course, with no commercial training and no knowledge wherewith to judge the merits of a mining venture, with the inevitable result that he now holds some South African gold-mining and land shares (it was in the days of the South African boom that he was buying stock) that are worthless and always were so. Multiply his case by the hundred thousand and ask the questions: Is that a fair deal to give mining investors? Can mining men afford to stand by and let the public take its chance?

The conservation of our mineral deposits for the benefit of the future is talked about, but is it realized that right here there is a conservation problem—a waste of money and mineral resources and a country's credit—that is greater than the conservation problem of the future and infinitely more pressing? The mining industry has progressed by leaps and bounds in the last few years, mainly owing to the introduction of improved mining methods and systems, but can you think where it would have been, if all the money and effort that was wasted, had been guided and turned into channels where it would have been of greatest service to the country? The industry in that case would have progressed more than twice as fast, because effort and money well spent have a cumulative effect. This subject is a huge one and has to be thought over nationally and not individually. One has to forget that the doings of any one fraudulent promoter are merely matters between him and his deluded clients.

Passive Mining Societies a Reproach

And yet there are mining societies, passive organizations for the most part, sleeping their lives away, technical journals doing good on the principle of hitting a head wherever seen, but without any organized means of tackling the question, and there is a mining public—professional men interested in a passive way also, but extremely indifferent to any active course of procedure. When you consider the trouble and the means available for combating it, is it not a grave indictment of the boasted mining progress today that the would-be mining investor gets no protection from the mining men whom his work and operations support? There is a general idea and feeling that the question of mining investment and the position of the mining investor need overhauling, revision and reorganizing; but while this is known, nothing is done because it is thought that individually nothing can be done. Perhaps nothing can be done individually, but much can be done collectively, and it is on this point that I cannot agree with the editorial.

At present, investment in mines is a sort of "no man's land," where good prospects get lost among the bad, where fraud and irresponsibility have full play and where the mining investor struggles around, often putting his money on the wrong horse, because he has no standard by which to judge of the merits of a proposal. He doesn't know: he isn't educated. Why should he not be?

Leaving aside a third proposal, which will be referred to later, two main lines of endeavor seem to present themselves, one of which is negative and the other posi-

tive; namely, the law of the land and mere simple education. The law gives no help; it is a class of machinery that is designed to deal with specific cases of wrong doing; it is an event after the crime and does nothing at all to get at the root of the trouble. One must look to education, and while the way to be traversed appears pretty dark and hopeless, it is partly because mining men are not actively helping.

There is one means, acquired at the point of the bayonet, which appeals to me. It is an education that in two years has, through sheer necessity, accomplished what years of writing and talking, legislation and individual effort, have failed to establish in another country. Today the meaning of what is being done has not yet fully dawned on the people, but the germ of the idea is there, and if it is carried to its logical conclusion, it will put a check on mining rascality and irresponsibility in Canada, that has never been done before; and it will conserve millions of dollars that would otherwise be wasted, and guide these huge sums into channels where their employment will produce the greatest good in the minimum of time. Look, for a moment, across the Atlantic.

As one result of the war, the people of Great Britain have learned the meaning of two important things—organized efficiency and combined effort. Moreover, they have learned them right down to the very soul of the nation. Out of this has come the demand for organization of the national resources, and out of that in turn the further organization of the natural resources of the Empire; and that in turn again implies the minerals among other products. That cry has come echoing across the Atlantic to Canada and has resulted in the creation of at least two bodies to undertake the work. One of these is a commission appointed by Sir George Foster, and the other a company, the Arthur D. Little, Ltd., of Canada, organized under the auspices of the Canadian Pacific Railway Co. I have been in touch with both of these bodies, and while I know their first thought is a survey of natural resources, I have taken the liberty of urging upon both the fact that the work should not stop there, but should be pushed to a proper use of the data collected.

Classification of National Resources

Doing that means that something more than a mere knowledge of where these natural resources are, must be acquired; it means that those deposits will have to be classified, as far as existing knowledge will allow, into those that are useful and those that are useless. At one blow, then, if this work is carried out, an end will be put to the long list of impossible enterprises that have been cluttering the mining-investment market from Canadian sources, and in their place another list of possible enterprises will be published, that at least will have enough merit to get a place upon the lists so evolved. This is a great step in the right direction. It creates a standard whereby the public can know the fraudulent from the useful. If an enterprise is based upon a deposit that is not on the list, the plain inference that all may read is that there is something wrong with that deposit, and there is thereby flashed forth a warning against investment and a warning that is backed by an authoritative body. If a proposal is brought out based upon information in the list, the investing public has at least some guarantee of genuine conditions so far as they can be reasonably ascertained.

Still, the creation of a list which would eliminate the worthless projects is not quite all that has to be accomplished. This list will get rid of a great deal of the proposal which is brought out by the man ignorant of the conditions upon which successful mining of this or that metal depends, but it does not cut out the promoter who may take a good project and build upon it such conditions that failure is certain to follow, and in doing so manage to fill his own pocket well. Therefore, there is one further step to be taken, and having realized the necessity of making the best of all available resources, it must also be realized that they cannot afford to be wasted after time and money have been spent to ascertain if they are there. The taking of this second step is what ought to follow the first. In the first instance waste of capital on the impossible prospect is eliminated, but the second enables the use of capital to be controlled in developing additional enterprises.

Right of Government Censorship

What I now desire to establish as a factor in the country's progress is to have these bodies, or at least the one appointed by the government, given the right of censorship over any mining project, or industrial proposal for that matter, proposed for the Dominion. In every enterprise, notwithstanding the varying conditions, there are certain fundamental factors peculiar to each case which must be complied with to meet with success. These factors consist of the proper relationship of capital to the extent of the deposit, the market, and the cost of production, the ratio of profit to the risk undertaken and the capital return. Some of these cannot be ascertained; but given others, some of the unknown ones can be calculated. In other words, engineers can calculate backwards, when given the capital, a reasonable return, and a redemption of capital at a certain rate, what the mining cost must be, and if conditions do not seem to approximate those calculated, the flotation of the project should be stopped. No project should be floated upon the public, which does not come within some reasonable limit of being what common sense dictates as possible.

Now if these two important steps are carried through, two extremely important objects that the editorial concedes as worthy are in fair way of accomplishment. A bold attempt will have to be made, and an attempt at a time when the temper and the feeling of the country is with it, to eliminate the waste effort in mining development; and conversely, that amount will have to be saved for investment elsewhere, and where it will at least have a sporting chance for life. The value of every dollar will be doubled to the country, for not only will it be saved from loss, but it will be reinvested where it creates a return, and capital once in the country will grow and bear fruit for all time. Efforts must be put forth to attain these objects. Conditions in Europe have suddenly done what centuries of effort under normal conditions could not accomplish. The one thing yet to be done is to get the people to understand what the haphazard conditions of the past have resulted in—how waste and stupid effort have resulted in loss not only to the country, but to their own personal business and pockets. If an educative campaign can be waged to that effect, it will not take long to eliminate the author and financier of the "wildcat." J. F. Kellock Brown.

Sydney, N. S., Jan. 3, 1917.

Mining and Metallurgical Machinery

Plain vs. Roller Bearings

While it has been generally conceded that cars equipped with roller bearings require less draw-bar pull than those with plain bearings, the actual difference in power consumption has been more or less a matter of conjecture. To settle this matter, an interesting test was recently made at the Coalbrook colliery of the Delaware & Hudson Co., Carbondale, Penn.

The test took place on the main haulage track. Two trains of ten cars each were employed, the cars of the first train being equipped with standard plain roller bearings, while those of the second train were equipped with flexible roller bearings. Between the locomotive and each train was placed the Hyatt railway dynamometer car, as shown in the accompanying illustration. This special testing car automatically records the pull, speed and time for any given run.

The loaded cars employed in the test weighed four tons each, and the total load of each train was the same. The

HYATT DYNAMOMETER TEST CAR

test was divided into two parts. The first part, devoted to the testing of the train of flexible-roller-bearing cars, consisted in hauling the train while the test car recorded the pull necessary to start the train and keep it running. The second part of the test resulted in similar data being recorded for the train equipped with the plain bearings. It was thus plainly demonstrated that from two to three times as much pull was required to start the train equipped with plain bearings as that needed for the roller-bearing equipped train. And it took two and one-half times as much pull to keep the train of plain-bearing cars running.

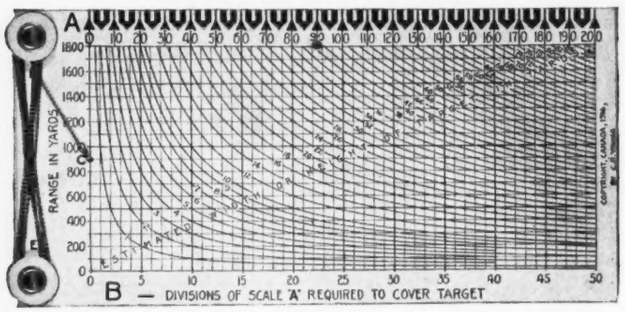
It was also demonstrated that one man could easily start a single car equipped with Hyatt flexible roller bearings, while three men were required to start one supplied with plain bearings.

The test aroused considerable interest in the anthracite district and was witnessed by a crowd of prominent mining men. While made in the coal-mining district, the data should be of interest to metal-mining men also.

Range Finder and Clinometer

Maj. C. R. Young, of the Canadian School of Infantry, Toronto, Ont., has devised a simple instrument for roughly determining distances which is of use to mining engineers. It is based on the fact that it is easier to judge the size of familiar objects on the landscape than to judge their distance from the eye. With a little practice, it is claimed, an observer can make very close estimates of such dimensions as heights of buildings to the eaves, heights of common trees, telephone and telegraph poles, etc., while the heights of many things such as doors, cars, fences, horses and men are matters of common knowledge; and from these the ranges or distances are easily determined.

The instrument has been used successfully on military reconnoissance surveys and field sketching. The designer and Maj. H. H. Madill made extensive use of it in the



RANGE-FINDING DIAGRAM, WHICH CAN BE USED IN TAKING TOPOGRAPHY

plotting of a new 4-in. = 1 mi. maneuver map of Camp Borden. Apparently, it could be used with equal advantage in any reconnaissance survey work.

The accompanying illustration shows the instrument, which consists of a heavy, opaque piece of white celluloid 3x6 in. A small cord is attached to the card at *C*, on the left-hand border of the diagram. The length of the cord is five times the length of the scale *A*, at the top of the card (about 25 in.). The rest of the card is nothing more nor less than a stadia diagram.

The end of the cord is held close to the eye, and the card is held at the other end of it in a perpendicular

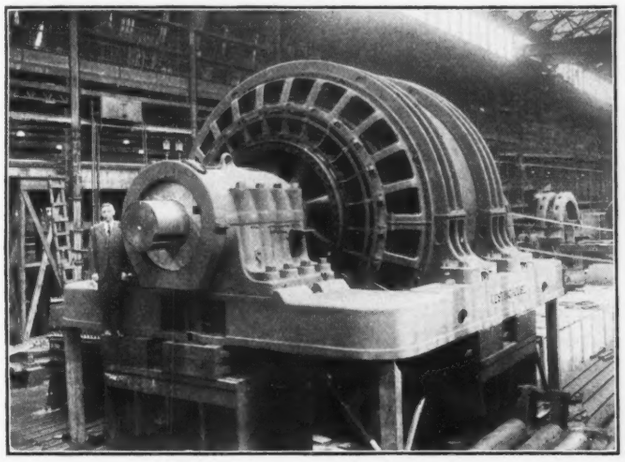
plane. The width or height of the target or object sighted at is read on scale *A*. Reading up from the same division on scale *B*, at the lower edge, to the curve of the corresponding reading, gives the distance or range to the nearest 100 yd., or feet, as the case may be, on the scale at the left.

The device may, of course, be used to estimate the dimensions of a target or object at a known distance, and by putting the cord through the center hole in the top scale and attaching a weight or plumb bob, it can be used as a clinometer. For this purpose the reverse side of the card carries a scale of angular divisions. The reverse side also has directions for using the instrument and a table of dimensions of common objects.

The device is copyrighted in Canada and may be obtained by engineers in the United States from Maj. C. R. Young, 98 Hilton Ave., Toronto, Ont., for 50c. postpaid.

The World's Largest Electric Motor

The accompanying illustration shows the largest electric motor ever built, which is being furnished by the Westinghouse Electric and Manufacturing Co. for driving a 35-in. reversing blooming mill in a steel plant.



THE LARGEST ELECTRIC MOTOR IN THE WORLD

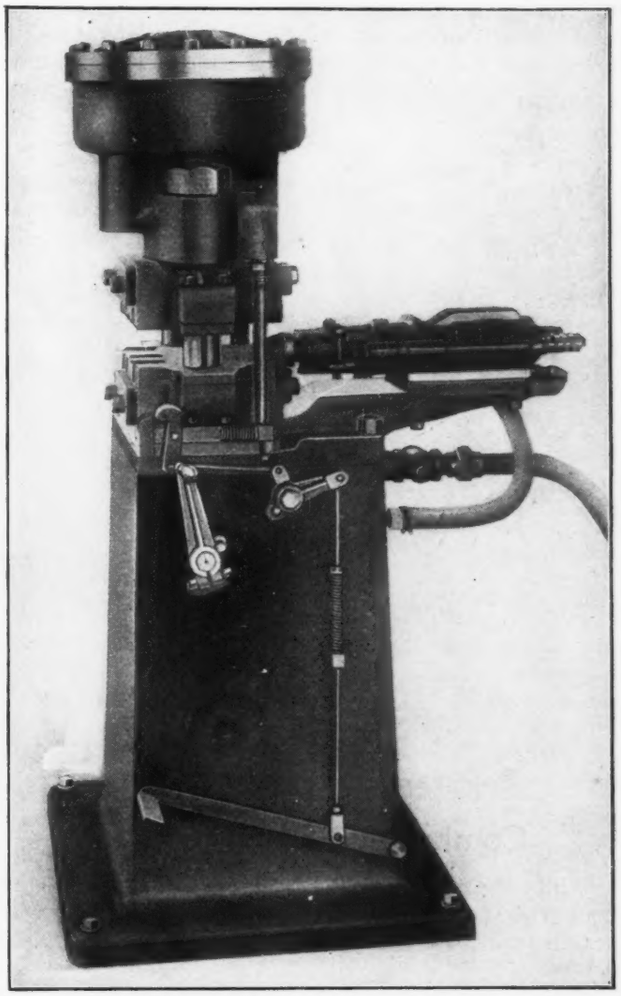
The machine is of the reversing type and has a capacity of 15,000 hp. Some idea of the gigantic size of this modern monster may be gained by noting the man standing alongside of the motor. This man is 6 ft. tall.

Denver Rock-Drill Sharpener

The Denver Rock Drill Manufacturing Co. has recently placed on the market a pneumatic drill-sharpening machine that it has been perfecting for the past year and a half. It is claimed that this machine is not only economical in the consumption of air, but that it will also operate effectively on lower pressures than are required by other types. The clamping die cylinder, as shown in the illustration, is placed directly above the die blocks, which position is largely responsible for the effectiveness of the machine under low pressures. No air is exhausted on the down stroke of the ram piston, as the piston is returned to its upward position by two small constant-pressure pistons, and when the blow is struck with the ram or it is brought down for the purpose of holding the steel while dollying, the air in this constant-pressure cylinder is merely forced back into the pipe line.

The dollying hammer is of the valveless type and exceedingly economical in air consumption. No springs are used in connection with the dollies, for they are held in their rearward position by a small plunger under constant air pressure. As this pressure is off when the hammer is not working, it makes the changing of dollies a simple operation, for there is no spring pressure to overcome. The absence of a spring also has the advantage of obviating trouble from spring breakage.

There is only a single air connection, consisting of a flexible hose, and as the machine exhausts into the hol-



DENVER ROCK-DRILL SHARPENER

low base, no exhaust pipe leading from the machine is required and the exhaust is so muffled that it is hardly noticeable.

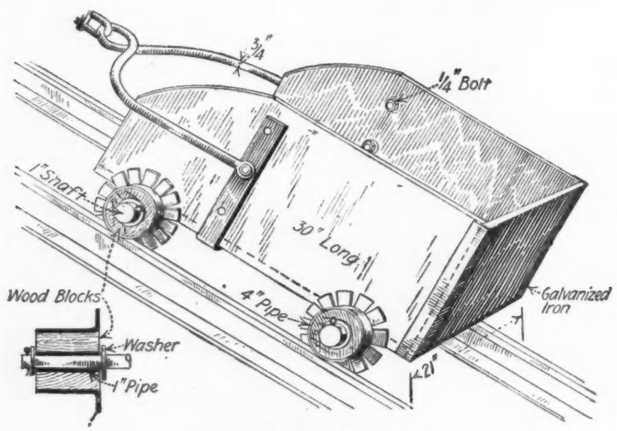
The pin-pulling attachment, shown in the illustration at the side of the machine, is operated by a pedal. The control is accomplished from a single lever, which actuates two separate valves and is placed where the operator can observe the working of the steel when the sharpener is in action. The manufacturers are also developing a smaller model, which they will soon put on the market. The use of drill sharpeners to replace the laborious and slow hand methods is becoming more and more common practice, even in small plants.

Details of Practical Mining

Skip for Inclined Shaft

By Hale H. Hunner*

The skip shown in the accompanying sketch has been used successfully for bringing up muck or water during the sinking of an inclined shaft. It weighs 50 lb. empty, has a capacity of 3 cu.ft. on a 30° incline and is intended to run on 2x4's for rails. Two men using an ordinary test-pit windlass easily draw it up. The rails end at a point

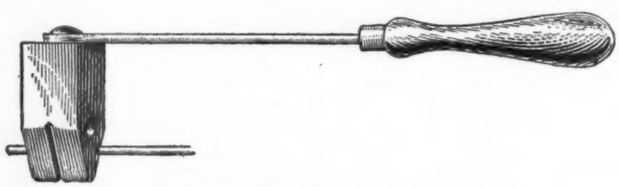


AN EASILY MADE SKIP

about 3 ft. above the ground level. The forward wheels dropping over the rail ends cause it to dump into a wheelbarrow, which one loader wheels out while the other lets the skip down. It can be made up from scrap found around the average blacksmith shop and, although light and easily made, stands up well under use.

Combination Soldering Tool

While the importance of soldering wire splices and ends of stranded wires is realized by most electrical workers, the work is often neglected from the lack of proper



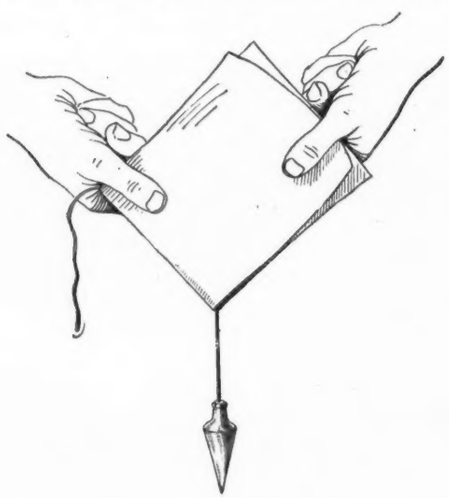
SOLDERING COPPER FOR SPLICERS

tools for doing it easily. A handy tool for this and similar work may be made by filing grooves in two of the working faces of an ordinary soldering copper, according to I. S. Chamberlain in *Power*. With a three-cornered file cut a groove about $\frac{3}{16}$ in. deep across one face and a similar one lengthwise of the other face. By running one of these grooves along the wire, it is much more readily tinned and soldered than with a flat-faced tool, and the solder does not roll off the work. Ends of wires, etc., may be conveniently tinned by dipping them in the miniature ladle of melted solder formed by drilling a hole about $\frac{1}{4}$x$\frac{5}{8}$ in. in one side of the copper and running it full of solder.

*920 Third Ave., Hibbing, Minn.

A Method for Taking Long Sights

The accompanying sketch from *Coal Age*, Dec. 23, 1916, shows a simple and effective help for taking long sights in outside surveying. It consists simply of folding a large piece of white paper around the plumb-bob string



SHOWING SIMPLE METHOD OF INCREASING THE ACCURACY OF LONG SIGHTS

in the manner shown in the sketch, the plum-bob of course being held accurately over the point. The instrument is sighted on the lower corner of the paper, which, having a white field, presents an unusually favorable aid for a close and accurate sight.

Food Supply for a Ten-Day Camping Trip

From time to time articles have appeared in the *Journal* on the kind and quantity of food supplied to miners and other workmen under various conditions. The food lists have usually been published in the form of "per man per day," so many ounces or pounds of each article, as the case might be. While these lists are of value in calculating the quantities of supplies necessary for a large number of men per month or multiple thereof, they are of little help in purchasing supplies for a small party that is to be in the field for a few days only. Often an engineer is called upon to make an examination of a

prospect or small mine that is not being operated and is too far from any accommodations to make daily round trips possible, and where the examination will require from one to two weeks' time. He will need one assistant to help him with the sampling and surveying. The conditions make it necessary that a camp be established and that the two men "batch."

To meet such conditions the following list of food supplies has been selected and is sufficient for two men for ten days. In compiling this list the idea has not been to see how large and fancy a choice could be made, nor yet how small—for if the exigencies of the case were such as to make it necessary, a man could exist on bacon, beans and hard-tack—but to make a well-balanced selection of nutritious and wholesome food with a few luxuries for variety, and with the secondary consideration of choosing such articles as will reduce cooking to a minimum. Several different units have been used in naming the quantities, but these are the units in which the articles would be purchased.

FOOD SUPPLY FOR A SHORT CAMPING TRIP

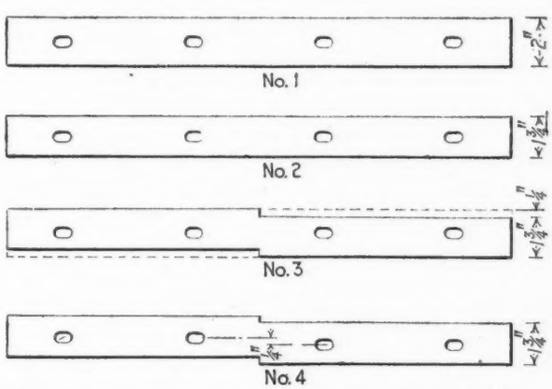
Salt	10c. sack	Butter	2 lb.
Pepper	10c. can	Jam (assorted)	6 small cans
(Other condiments if desired)		Fruit (assorted)	6 cans
Sugar	50c.	Vegetables (assorted)	4 cans
Milk	6 small (gill) cans	Beans	4 cans
Coffee	2 lb.	Syrup	1-qt. can
Tea	½ lb.	Lard	3-lb. can
Bacon	6 lb.	Rice	1 lb.
Corned or roast beef	2 cans	Raisins	1-lb. package
Eggs	4 doz.	Crackers	2 10c. packages
Flour, pancake	3 packages	Cookies	6 packages
Bread	6 loaves, large (preferably in glazed paper)	Cheese	3 lb.
		Potatoes	50c.
		Onions	10c.

If any kind of breakfast food is taken, the milk item must be increased. Other articles not food, but which come under food, are matches (plenty of them), soap and candles. And be sure to take a clean dish towel along.

Leveling a High Joint in Shaft Rails

By S. Ford Eaton*

One of the trials of the trackman in mines using incline shafts and having acid water is the high joint. In spite of his vigilance drip will find its way from the timber to the ball of the rail. A surprisingly short time is required by the constantly dropping water to cut away enough of the rail to give the skip quite a bump. Then it's up to the miner to put in a new length of rail. Corrosion in this class of mine is rapid and, combined with the wear of the skip wheels, will cut down the height of the rails considerably in a few months. When a new length of standard dimensions is put in, a high joint results. Assuming that the difference in height is ¼ in., the illustration shows the right and wrong type of fishplate with which to remedy the trouble. No. 1 is the standard fishplate 2 in. wide. Nos. 2 and 3 were failures. No. 2 is a plate made of strap iron 1¾ in. wide, all holes bored in the same line. No. 3 is a standard plate with a ¼-in. cut half the length of the plate removed from diagonally opposite portions of the edges. When Nos. 2 and 3 were used, a metal or wooden shim ¼ in. thick was placed under the lower rail. No. 4 will do the work. It is made of strap iron 2 in. wide and cut the same as No. 3. Holes are bored so that the lines of centers in each end are ¼ in. apart. No shim is necessary.



THE EVOLUTION OF A FISH-PLATE TO LEVEL HIGH RAIL JOINTS

*Foreman, Vantrent Mining Co., Vantrent, Calif.

Bending Rails with a Portable Hoist

By H. L. Hicks*

The necessity for rail bending is not infrequent in mine-track work, and the usual method of cranking the rails through a rail-bending machine is a slow, back-breaking and sometimes heart-breaking job.

The method of overcoming this condition at the surface plant of one of the Juneau mines, is interesting.

THE "LITTLE TUGGER" HOIST USED FOR BENDING RAILS

Fifty-pound steel rails were being bent by hand with a three-wheel bender when the idea of using an air-operated "Little Tugger" hoist to pull them through was conceived. The rail bender was fastened on the track at a point where the curvature was approximately the same as that of the rails to be bent and the "Little Tugger" placed a little more than a rail's length away. A rail was started through the bender and the hoist pulled it the rest of the way. When the radius of curvature was small, it was found advantageous to use a block and tackle to increase the power of the hoist.

When cranking the bending machine by hand, eight men were able to bend but eight rails a day. With the assistance of the "Little Tugger," two men bent six rails per hour, the other six being kept busy carrying rails to and from the machine.

The hoist is bolted to a timber skid, as shown in the illustration. This arrangement is easily anchored in any of the many places where the hoist is used, and at the same time two men can easily carry it about.

*Ingersoll-Rand Co., 11 Broadway, New York.

Electrolytic Hydrogen and Oxygen Generation

By L. V. Curran*

The savings and improvements in service of the electrolytic method over the sulphuric-acid and zinc method of hydrogen generation have been clearly demonstrated during the first three weeks' operation of an electrolytic plant at the Copperhill property of the Tennessee Copper Co. The plant is an American Oxygen Co. 15-cell installation guaranteed to generate 1,800 cu.ft. free hydrogen, the atmospheric conditions not being named.

The principal equipment is as folllows: One 25-kw. 60-volt Crocker-Wheeler d.-c. generator, direct-connected to one 30-hp. 220-volt 60-cycle three-phase 900 r.p.m. General Electric Co. slip-ring motor; fifteen American Oxygen Co. standard oxygen-hydrogen generating cells; two 50-cu.ft. capacity gasometers; two 6⅛x3x5-in. Queen City Supply Co. two-stage tandem belt-driven compressors, 200 r.p.m.; one 15-hp. 220-volt 60-cycle three-phase 1,150 r.p.m. Triumph Electric Co. induction motor; ten 15x48-in. drums, tested to 1,000 lb. water pressure, fitted with right-hand connections; fifty-four 15x48-in. drums, tested to 1,000 lb. water pressure, fitted with left-hand connections; two 4x10-ft. receivers tested to 300 lb. water pressure.

The plant is installed in a wood-frame, corrugated-iron addition to the smeltery power house and contains 600 sq.ft. of floor area, 160 sq.ft. of which is used for drum storage. The remainder contains the present equipment and space providing for the addition of five more cells which are now on order. The plan of the plant is shown in the accompanying figure.

The Necessary Plant and Procedure

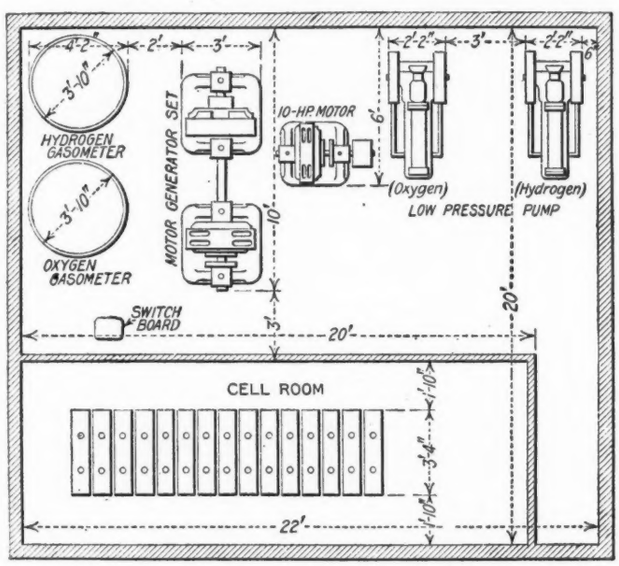
The cells consist of an iron tank 40x6x47 in. high, forming the positive electrode, and two $\frac{3}{16}$-in. iron plates, 36x39½ in. high, forming the negative electrode, an asbestos fabric entirely inclosing the latter and preventing the two gases from mixing. The cells are spaced on 9-in. centers and inclosed in 18x9x8½ ft. high cellroom, in order that the heat of the cells may be retained as much as possible, a greater economy resulting. The water is kept charged with sufficient caustic soda to maintain a density of 26° Bé., about 75 lb. per cell being required at first filling.

The most economical rate of generation with these cells is reached when the current is 400 amp.; so the current is kept at that strength, 40 volts being required when cold and 36 volts at the running temperature, which is about 127° F. In order to minimize the danger of the gases getting mixed, the equipment for collecting the gases from the cell tops and for compressing into the drums and receivers is arranged entirely in duplicate, with no cross-connections, the scheme of left-hand and right-hand connections being carried out on the compressor discharges and drum connections, for hydrogen and oxygen respectively. Further precautions are taken by watching the polarity of the generator and by making frequent tests of the oxygen.

The gases are collected into 1½-in. manifolds with rubber-hose connections to each cell and are led into two gasometers which, as often as filled, are pumped down, by the two compressors driven by the 15-hp. motor through a lineshaft. The oxygen is pumped into drums and used for welding and cutting and for certain heavy lead work.

The hydrogen is pumped into the "hydrogen system," consisting of two 4x10-ft. receivers, one at the gas plant and one at No. 1 sulphuric-acid plant, approximately 800 ft. distant, the two receivers being connected by a ½-in. line. From the acid-plant receiver the gas is piped through the plant in ½-in. and ¼-in. lines, being used at 4 lb. pressure. The pressure carried on the gas-plant receiver is 200 lb. and on the acid-plant receiver, 50 lb. Hydrogen is also compressed in drums for use on work at the other plants or in places isolated from the hydrogen system. Compressed air is used with the hydrogen for lead work except where there are no air lines or where the work is particularly heavy, when the oxygen is used. Hydrogen is also used with oxygen at the welding shop in cutting.

The output of the plant was found from test to be 12¼ lb. of hydrogen or 97¼ lb. of oxygen per 24 hr. The present hydrogen consumption is 14¼ lb., 5½ days per week. It is therefore necessary to operate the plant 153½ hr. per week, or 91.4% of the time. The present demand for oxygen is 19¼ lb. per day, six days per week. Current is bought at $30 per hp.-yr.; the power input of the plant is 26.25 hp.



LAYOUT OF PLANT FOR THE ELECTROLYTIC GENERATION OF HYDROGEN AND OXYGEN

The first cost of the plant was $6,287.42. The present operating costs are:

YEARLY OPERATING COSTS

Power, 26.25x$30x91.4%	$719.78
Engineers, 8,007 hr. at 18½c	1,487.68
Interest and depreciation, 12%	754.49
Inspector lines, 4,556 hr. at 16⅔c	759.48
Total yearly expense	$3,721.43

At the present rate 6,022.5 lb. of oxygen and 4,086.9 lb. of hydrogen are used per year. The following would be the cost of replacing the service with bought oxygen and hydrogen generated with zinc and acid, assuming the theoretical amount of hydrogen is realized from the gen-

*Mechanical engineer, Tennessee Copper Co., Copperhill, Tenn.

erator charges; that is, 0.0309 lb. hydrogen per pound of zinc:

COST OF HYDROGEN AND OXYGEN BY ZINC ACID METHOD

132,262 lb. zinc at 10c. delivered	$13,226.00
6,022.5 lb. oxygen at 32c.	1,927.20
Two generator boys at 16½c., 4,556 hr.	1,518.86
Acid, estimated	858.00
Total	$17,530.06
	3,721.43
Annual saving	$13,808.63

The actual savings amount to more than shown by the figures given, as no more trouble is expected from acid-eaten hydrogen lines or freeze-ups in the winter. The pressure is uniform, and the gas is of much higher grade than before.

It is now being planned to replace gasoline, used in the electric shop and laboratories, for heating purposes by the electrolytic hydrogen. It will be noticed that the saving of oxygen alone makes the investment well worth while, even though the amount of oxygen used is but one-sixth the output of the plant.

Foreign Trade in Copper

Exports of copper from the United States in November, 1916, are reported by the Department of Commerce as follows:

	Lb.
Ore and concentrates, contents	485,834
Unrefined, etc., in bars, pigs, etc	1,266,869
Refined bars, etc	48,920,718
Old and scrap	29,968
Plates and sheets	7,906,287
Wire	1,565,832
Total	60,175,508

The weight of ore exported in November was 3952 tons; of concentrates, 817 tons.

Imports of copper into the United States in November, 1916, are reported by the Department of Commerce as follows:

	Lb.
Ore and concentrates, contents	6,233,494
Matte, contents	233,227
Unrefined, etc., in bars, pigs, etc	20,209,191
Old, etc., for remanufacture	794,404
Composition, copper chief value	7,549
Total	27,477,865

Actual tonnage of copper-bearing material imported in November was 17,398 tons ore, 10,615 tons concentrates and 268 tons matte.

Manganese in 1916

Preliminary estimates of the United States Geological Survey show that the production of manganese ore in 1916 was about 27,000 tons, the greatest since 1888 and nearly three times that in 1915. The estimate does not include manganiferous iron ores that contain less than 40% manganese. The output came largely from seven states, which in order of production are: California, Arkansas, Arizona, Georgia, Virginia, Utah, Colorado. This is the first year in which a western state remote from the steel-producing centers has contributed the largest amount of manganese ore. The activity among manganese mines in California is due largely to the market for ores provided by the Noble Electric Steel Co. at Heroult. Ores of high grade adapted for use in dry batteries, (containing 80% manganese dioxide and less than 1% iron) were produced in Arizona, California, Utah, Colorado and Virginia, but the amount produced was still scarcely one-tenth the normal demand.

Imports of manganese ore for the first ten months of 1916 amounted to 495,299 tons, of which 401,177 tons came from Brazil. Imports of ferromanganese for the first eleven months of 1916 were 73,435 tons, which is nearly 50% more than for the corresponding period in 1915, though bearing a smaller ratio to the domestic production.

An important consequence of the prevailing high prices of manganese alloys is the attempt on the part of steel makers to use substitutes. The extent to which substitutes for manganese in steel may be used has not been determined, but experiments by several steel works show that an alloy of iron, carbon and titanium may be satisfactorily used to replace a part of the ferromanganese commonly added.

Government Aid for Mining in British Columbia

WASHINGTON CORRESPONDENCE

There is a movement on foot in British Columbia to develop the many natural resources of that province. The recent propaganda along this line would seem to fill a long-felt desire expressed by the Northern mining men, to enlist the aid of the government in bringing mining conditions up to a satisfactory standard measured by comparison with American development.

With a view of enlisting government aid, a delegation of men representing the business and financial interests of Vancouver Island recently called upon and were given audience by Premier Brewster. The Minister of Mines, Hon. William Sloan, was also present at the conference.

The attention of the Premier was called to the fact that under the old Canadian government the natural resources of British Columbia had been sadly neglected in so far as governmental aid was concerned. Premier Brewster, however, pointed out to the delegation that the old policy would not necessarily be that of the new régime and made it clear that the new government would lend all possible aid to any suggestion of value to the development of the mining industry. Specific cause of grievance was cited and it was shown that prospectors were prone to shun, so far as possible, the territory of British Columbia because other provinces accorded them far better facilities and better treatment. The suggestion was made to the Premier that the government adopt certain measures to render aid in assisting the prospector to open his claim in British Columbia.

In a brief address to the conference, Premier Brewster said much that was highly significant in reference to domestic resources and the investment of foreign capital. He said in part: "I have always wondered why, when we have that large deposit of iron ore on Texada Island, with a short and cheap water haul to the coal measures on Vancouver Island and all the other requisites, we have yet no steel industry. I feel that Hon. Mr. Sloan will find need for a strong grip upon the industry. The ramifications of some of the large concerns now interested in British Columbia properties show the influence of aliens. If this government finds that influence endeavoring to prevent our ores going to the British government, that moment we shall step in. The intention of the government is to sanely and seriously take your representations into consideration and eventually work out our policy, on which the future prosperity of the province so

greatly depends, in as safe and sane a manner as is humanly possible."

At the conclusion of the remarks of the Premier, Mr. Sloan stated that he was glad to hear his views on the subject and was pleased to find that they coincided with his own. He said that while the Canadian government stood ready at all times to assist the investors of foreign countries to secure sound investments in British Columbia and elsewhere, the government must primarily insist that British capital get fair play. He hinted at some depreciating influence which he said was at work in the province, but which the government had under close surveillance. Mr. Sloan concluded that notwithstanding the difficulties in the way of the establishment of a flourishing mining industry, the ultimate result would be highly successful.

Foreign Trade in Lead and Zinc

Imports of lead and zinc during October and November, 1916, are reported by the Department of Commerce as follows:

Articles and Countries	Contents, Lb. October	November
Lead Ore:		
France	6,136	.....
England	192,499	.....
Canada	48,000	2,204,130
Panama	7,590	.....
Mexico	3,126,911	1,577,266
Chile	1,012,744	6,622
Peru	222,147	9,625
British South Africa	660,435	.....
French Africa	.....	294,623
	5,276,462	4,092,266
Lead in Base Bullion and Bullion:		
Panama	4,766	.....
Mexico	672,837	1,515,956
Peru	35,908	.....
	713,511	1,515,956
Lead, Pigs, Bars and Old:		
England	12,097	.....
Panama	8,222	2,193
Mexico	2,696,004	760,697
British West Indies	1,940	3,258
Haiti	667	.....
	2,718,930	766,148

The actual tonnage of lead ore imported in October was 14,518; in November, 10,104. The imports of zinc ore amounted to 13,666 tons in October and 18,833 in November. The countries of origin and the metal contents were as follows:

Countries:	Contents, Lb. October	November
Canada	567,600	1,788,600
Guatemala	32,000	.....
Mexico	8,810,211	7,447,135
Australia	.....	6,389,299
French Africa	.....	1,410,767
	9,409,811	17,035,800

Zinc in blocks, pigs, etc., was imported as follows (in pounds):

Canada	.....	4,348
Panama	10,813	2,876
Cuba	9,129	16,074
Haiti	810	.....
	20,752	23,298

Imports of zinc dust were as follows (in pounds):

France	66,138	.....
Japan	89,950	69,775
	156,088	69,775

Exports of lead and zinc were as follows (in pounds):

Lead, Pig, Bars, etc.:		
Produced from domestic ore	18,792,429	12,804,551
Produced from foreign ore	1,097,672	1,219,297
Zinc, Pigs, Bars, etc.:		
Produced from domestic ore	36,282,141	33,352,905
Produced from foreign ore	13,217,611	3,520,353
Zinc, plates and sheets	3,705,253	4,628,415

Corporation-Income Tax Suit Won by Guggenheim Exploration Co.

The Government has lost its suit against the Guggenheim Exploration Co. for the collection of a $67,471 corporation-income tax. This amount was claimed to be due as a result of the sale by the company in 1911 of 112,490 shares of American Smelters Securities Co. stock to the American Smelting and Refining Co. for $6,749,000. This transaction, the Government claimed represented a profit and was not returned by the Guggenheim company in calculating its tax for that year. The shares were listed on the company's books prior to the sale at $1 each, but were sold at $60. The Government therefore alleged that the company made profits amounting to the difference. In the United States Supreme Court Judge Martin T. Manton has sustained the defendant, however, by declaring that the book value was not necessarily the real value. In making this ruling Judge Manton, in part, said:

The net income of a corporation subject to the excise tax is not to be determined by bookkeeping facts, but by real facts. An increase in the book value of the assets of a corporation by a valuation of property does not constitute any part of the gross amount of its income received within the year.

Some further evidence of valuation is found in the annual reports of the board of directors of the defendant to its stockholders for the years ended Dec. 31, 1908, and Dec. 31, 1909. In the first year it is stated that although these shares of stock were carried on the books at $1, there was every reason to believe that they were worth at least $40 a share, which meant $4,500,000.

In the 1909 report a statement is contained that the company was earning 7% on its common stock and it was worth par. This report was rendered within a few months after the corporation excise law went into effect. Afterward Mr. Hills, of the American Smelters Securities Co., testified that the company not only earned the dividends on its preferred stock, both series, but 11% on its common stock. This was the showing for the year 1909.

The word "income" is not synonymous with the word "receipts." Income as used in the statute must be considered in contradistinction to property and invested capital. It is manifestly the purpose of the statute to tax the net income for the year in which the assessment is made.

Applying these rules to the necessary conclusion of fact found in this case, it follows that there is no income, gain or profit accruing to the defendant during the taxable year in question, and the Government has failed to support the burden assumed in prosecuting this claim.

Sulphuric Acid in 1916

The estimated production of sulphuric acid of strengths of 50°, 60° and 66° in 1916, expressed in terms of 50° acid, was 4,475,000 tons, according to the United States Geological Survey; this is an increase over the production in 1915 of more than 15%. The increase was distributed about equally between acids of strengths of 50° and 60°. There was a decrease in production of 66° acid.

The most notable feature in the sulphuric-acid industry was the enormous increase in the production of acids of strengths greater than 66°. The estimate shows a production of these stronger acids of over 1,000,000 tons, as against less than 200,000 tons in 1915.

The estimated output of acids of strengths of 60° and 66° includes byproduct acid produced at copper and zinc smelteries. The output of acid so produced in 1916, expressed as 60° acid, amounted to nearly 950,000 tons, or practically the same as in 1915. Over 110,000 tons of acid of higher strengths was produced at these smelteries, nearly double that produced in 1915.

Editorials

Copper Statistics

The acuteness in the copper situation last fall, which permitted the extravagant rise in price to above 30c., was due primarily to a shortage in the refining capacity. The production of the mines, stimulated as never before, increased rapidly, but to a large extent the new supply could not be put through the refineries. It was well known, however, that new refining capacity was being provided and would in the main be ready for use early in 1917.

The statistics do not afford us a clear record of the events of 1916, but they give us an idea. The total production of blister copper, plus the imports from foreign countries—that is, the supply of raw material coming to American refiners—was about 2,500,000,000 lb. The production of refined copper was about 2,300,000,000 lb. There was evidently accumulated, therefore, a surplus of 200,000,000 lb. of crude copper, between the smelteries and the outgoing gates of the refineries. This does not mean that such a quantity of copper was piled up in the yards or warehouses. Some of it may have been retained at the smelteries, a much larger quantity than usual was probably in transit on the railways, and some of it had gone into the new vats of the refineries. Considering the industry as a whole, the statistics mean simply that the smelters produced a certain quantity of copper in Arizona, Montana, etc., which was dispatched to the refiners, or was ready to be dispatched; and the refiners put out a certain quantity of refined copper at New York, Baltimore, etc.

The statistics are most unsatisfactory in their failure to reveal the situation toward the end of 1916, rather than for the whole year, during which pronounced changes occurred. We should like to know what was the relative production of crude and refined copper in the last two months or in the last quarter.

There is one important thing, however, that we do know; namely, that the refining capacity had been greatly increased during the last half of 1916 and at the end of the year was as follows: Electrolytic, 200,000,000 lb. per month; Lake, 22,500,000 lb. per month. Adding to this the output of the mines such as Arizona, Tennessee, Detroit, Braden and Chuquicamata, that does not have to go through the refineries, say 14,500,000 lb. per month, we have a total capacity at the present time for the delivery of about 237,000,000 lb. of copper available for consumption. This is in excess of the average—200,000,000 lb. per month—production of crude copper in 1916, but as previously mentioned, we do not know just what was the rate thereof at the end of the year; that is, whether the smelters were then gaining on the refiners, or vice versa.

Anyway, unless something calamitous happens in 1917, we look for a very large production of refined copper. The monthly rate may easily rise to 250,000,000 lb., and the year's total may approach closely the unparalleled figure of 3,000,000,000 lb.

Tin in Nevada

The recent discovery of tin deposits in a rhyolite flow in Nevada is in several respects of great interest. As all mining engineers know, we are very poorly supplied with tin deposits in the United States. Those in the southern Appalachian states, as well as those in the Black Hills and southern California, have proved either too poor or too pockety for working. At the present time our annual production of about 100 tons of metallic tin comes almost exclusively from western Alaska.

The discovery in Nevada may or may not be of economic importance, but it calls attention to a novel and remarkable type of deposit and, still more important, it opens up possibilities of prospecting in the enormous areas of rhyolite flows in the Great Basin and elsewhere in the West. Very similar deposits have been known for some time in several states in Mexico, particularly Durango and Guanajuato. The ore is a kidney-shaped or mammillary cassiterite, which is associated with hematite, chalcedony, opal, tridymite and quartz, a most peculiar combination from a mineralogical standpoint. It is believed that the veins result from the action of hot waters, which near the surface have extracted emanations from the rhyolite very soon after its solidification. The uncommercial character of the tin deposits of similar character in Mexico prevents us, however, from being very sanguine respecting the similar deposits in Nevada.

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The Treadwell Mines

The Treadwell group of mines, for many years large and regular dividend-payers, fell not long ago into evil days, as is well known. Last summer a commission of engineers, comprising F. W. Bradley (president of the company), Hennen Jennings and H. C. Perkins, examined the properties with a view toward amalgamation of the companies. They advised such an amalgamation, but incidentally their statements respecting the mines were a rather startling revelation to the public. Since then some alarming reports have been in circulation, principally the result of erroneous deductions, as so often is the case. It is fortunate, therefore, that there has just come to hand a very minute and comprehensive report of the president to his board of directors under date of Oct. 20, 1916.

F. W. Bradley is one of the original exponents of the policy of frankness and publicity in the affairs of mining companies, and for many years the reports of his companies—the Alaska group and Bunker Hill & Sullivan—had been all that such reports should be. Their stockholders have had full and exact information respecting all their affairs. This same frankness has just been exhibited again, although it was a disagreeable statement that had to be made.

The mines of Treadwell Island are situated right alongside of the Gastineau Channel, their workings are mostly below the sea level, and some of them are under the chan-

nel. During the last year or two there have been some threatening collapses of ground and even some infiltrations of sea water. The rumor has been circulated that this might spell loss of the mines. In fact, nothing like that has ever been considered to be probable. The situation has been studied very carefully and is pronounced to be not dangerous, but it is recognized that there must be careful mining lest it become so. In this, as in many cases, forewarned is to be forearmed.

The other serious thing in the situation of the Treadwell mines is the entrance of the lower workings into a lean zone. The ore of these mines has always been rather uniform, and going by the experience of years, reserves have been calculated from large blocks of ground that have not been closely crosscut. In raising from the lower levels to mine such a large block the grade was found to fall off rapidly and there was similar experience in sinking from above. Finally the management was forced to the conclusion that there is a large zone in the lower part of the mine in which the ore is not of payable grade. Below this, however, it has been proved that there is payable ore, wherefore it is not a case of the mines petering out, but rather of disappointment and delay. Careful plans have been made that are expected to put these companies into good position again in a minimum of time. These plans are explained fully in Mr. Bradley's report.

We doubt not that it was disagreeable to him to have to make this report, but how much better it was to tell all the facts without mincing matters than to tell only half-truths and try to avoid the admission of mistakes by obscure and confusing explanations. The Treadwell mines have been great producers and good dividend-payers under Mr. Bradley. May their eclipse be of short duration, and may they soon shine again with their former brilliancy.

Nickel, Manganese and Chromium

The position of the United States in times of possible stress, as to supplies of the three most common steel-hardening metals, manganese, nickel and chromium, is not altogether reassuring. Our production of manganese and chrome ores has increased considerably under the stimulus of abnormally high prices in 1915 and 1916. In fact, the production of pure manganese ores in 1916 amounted to nearly 27,000 tons, against 9000 in 1915. Still it is very far from filling our domestic needs. A timely attempt has been made recently by the United States Geological Survey to catalog the occurrences of possible supplies of nickel ores, which, though not rich enough to use under ordinary conditions, might serve as emergency supplies. The result of this survey is about to be published. Aside from sporadic and poor deposits of nickel-bearing pyrrhotite, low-grade oxidized ores are known to exist, but it may well be doubted whether any process could be devised to treat such ores effectively. May we hope for discoveries of new deposits? It is possible but doubtful. Areas of gabbro, like that of Duluth, and those of serpentine, as in California, should be closely scanned. A possible source of nickel which has recently attracted some attention is found in the iron ores of Mayari, Cuba. These limonite ores, which are derived from the weathering of serpentine, average about 0.6% nickel oxide, and experiments have been carried out recently looking toward the extraction of this nickel. It is said to have been ascertained that while most of this nickel is present as a hydrous silicate, there is a smaller part which is insoluble and it is suspected that nickel oxide may be present. It is also well possible that in some parts of Cuba larger deposits, like those of New Caledonia, may still be found.

On the whole the situation is discouraging, and this also applies to manganese and chromium. There is no use looking for chromium except in areas of serpentine, and all deposits so far found in the United States have been spotty and small. Three thousand tons of ore produced against seventy-six thousand tons imported—that tells the story.

Manganese is more widespread, and many old mines, especially in Virginia, are being reopened. There are some promising low-grade iron-manganese ores, but the pure and high-grade manganese dioxide is very scarce. Such material is used, among other things, for dry batteries, and it is said that manufacturers of these have found it very difficult to obtain a supply. Aside from the unique oölitic ores of southern Russia, the manganese deposits seem to thrive best under conditions of tropical weathering such as do not obtain in this country.

Cuba is rich in serpentine. There is also much manganese, and this southern neighbor of ours could possibly help us out quite a little in case of all three of these necessary metals.

The index for Vol. 102 of the *Engineering and Mining Journal* will be mailed with this issue. Any subscriber not receiving a copy of same should notify the subscription department at once.

The total mineral production of the United States in 1916 is estimated by the U. S. Geological Survey at about $3,000,000,000. This figure is spectacular, but without any doubt it includes a good deal of duplication.

The affairs of the American Institute of Mining Engineers are enlivened this year by a real election for president by letter-ballot. This is perhaps an innovation in the history of the Institute. Anyway, there has been nothing like it during the last 30 years. The opposing candidates are Sidney J. Jennings and Philip N. Moore. Both of them are eminent mining engineers. Either of them will make a distinguished and efficient president of the organization.

We devote a good deal of space this week to an article by Mr. Honnold on the Commission for Relief in Belgium. This is not directly a mining and metallurgical subject, but we consider that it ought to be put fully before our readers, for it relates to what has been, and is, distinctly an engineering job, as Mr. Hoover has characterized it; and Mr. Hoover and Mr. Honnold are both distinguished mining engineers who in this work are elevating and glorifying the profession. Relatively few persons have any clear idea of what they have done and how they have done it. Matters of diplomacy, finance, policy and organization are presented. The scope, magnitude and efficiency of the work make it, as Mr. Asquith the British Prime Minister has said, one of the finest achievements in the history of humane and philanthropic organization. This is what Mr. Honnold tells about. We urge a careful reading of his article.

BY THE WAY

"Simp" spelling is again agitating the cerebellums of some members of the A. I. M. E. who are out with Institute circulars in its behalf.—Still, yet, or again.?

In speaking of the present actions of the stock market, a financial writer in the New York *Evening Post* remarks caustically: "The market does not know when the war will end; even if it knew when peace would come, it does not know what is going to happen when it does come. It is not even sure what is going to happen if the war continues. Otherwise it can proceed with certainty."

The first steel company to publish its 1916 earnings is the Midvale Steel and Ordnance Co., which shows its bond interest earned more than 16 times over. In comparison with this it is stated that among the other leading steel companies Lackawanna Steel is expected to show similar earnings of more than seven times, United States Steel over 11 times, Bethlehem Steel 14 times approximately and Republic Steel more than 30 times.

Making skilled artisans for the various metal industries out of wounded soldiers is the object of a school opened in Düsseldorf, Germany, according to a report in *Iron Age*, Jan. 11, 1917. When the men enter this school as convalescents, the greater part of the day is spent in theoretical instruction, but as they grow stronger, the lecture hours are gradually curtailed and the men receive practical instruction in the large workshop of the school, where they do easy work on machine tools. The men easily find employment after finishing their training.

Two years ago, when there was a surplus of labor in the Lake Superior district, two Cornish miners traveled from the Michigan district into Minnesota, but they were unable to get work at any of the mines where they applied and so decided to try their hand at farming. They applied to a farmer for employment and were asked what they could do about a farm. They replied that they could do anything and so were assigned to the task of digging potatoes. The farmer put them to work and then went to attend to other duties. He returned in about two hours to see how the new hands were getting along and found that they had dug a hole about 8 ft. in depth. He asked the pair what they were doing and one of them replied: "Well, they taters played out on we at grass roots and us do be sinkin on they."

One of the large uses for aluminum since the war began has been for the manufacture of rifle bullets. The modern high-powered rifle bullet is about 0.3 in. diameter and has a long, sharp point. In order to prevent a bullet of such shape from upsetting in the gun when propelled with the high velocity of over 2000 ft. per second, it is provided with a hard-drawn sheathing of copper-nickel alloy. One of the belligerents places within this sheath, at its very point, a small pellet of aluminum. The remainder of the sheathing is then filled with lead in the usual manner. This construction in no way produces a "dum-dum" bullet, for the simple reason that the aluminum is harder than lead and "mushrooming" of the nose of the bullet is impossible. The aluminum is intended to give increased accuracy of fire and a flatter trajectory. A good many thousands of tons of aluminum have been used for this purpose.

The New York *Evening Post* has commented editorially as follows regarding the Belgian Kiddies: "An ingenious step in the work of relief for the suffering people of Belgium has been taken by the mining engineers of the United States in instituting the Belgian Kiddies, Ltd. The stock of this company is to be issued at $12 a share, and the purchaser of each share will receive his dividends in the shape of the consciousness that his $12 will provide one sadly needed meal a day throughout a whole year for one Belgian child. Administrative expenses are completely provided for by the Commission for Relief in Belgium, so that every penny invested goes for the actual purchase of food. What makes the action so appropriate is that Herbert C. Hoover, the head of the commission, is one of the most eminent of American mining engineers, and has devoted his whole time and his extraordinary organizing ability, ever since the beginning of the war, to the work of Belgian relief. We are confident that the mining engineers will invest liberally in this unquestionably sound and paying stock, and we trust they will do more than that. Many of them are in close relations with capitalists of great wealth, whom a little urging from such a quarter would suffice to convince of their duty and their opportunity in the matter. From such men it is to be hoped that really large subscriptions will be successfully solicited."

The following poem by K. H. Chisholm, of the Bureau of Mines, appeared in the December, 1916, *Safety Bear Letter* of the California Industrial Accident Commission:

SAFETY FIRST

Never let your fancies roam,
Never be "Nobody Home";
Keep a level-headed dome,
"Safety First."

Be sure the treacherous roof you test;
Be careful where you sit to rest;
Beneath a timber's always best,
"Safety First."

Don't open powder with a pick,
It might explode, then death comes quick;
Never do this foolish trick,
"Safety First."

Look out for electric juice,
And see the timbers are not loose,
And beware the mule's caboose,
"Safety First."

Don't indulge in any booze;
Keep the car wheels off your shoes,
And be liberal with the fuse,
"Safety First."

Study up that first-aid fad,
If you don't, you'll wish you had,
Some day you will need it bad,
"Safety First."

There are no angels watching you;
Other guys have found it true
That God helps those who think and do,
"Safety First."

Personals

Harry O. Robinson, formerly an operating engineer of Mexico, is in New York for a short stay.

Robert J. Burgess has become associated with the Merrill Metallurgical Co., San Francisco.

Charles T. Kirk, state geologist of New Mexico, has been inspecting mines in Boulder County, Colo.

A. T. Budd, a prominent mining man of Haileybury, Ont., has returned from a trip round the world.

Professor Frank D. Adams, of McGill University, has been elected president of the Geological Society of America.

Captain J. P. Hodgson, of the mining department of Phelps, Dodge & Co., Ariz., is visiting in the Lake Superior district.

Henry Cribb, manager of El Amparo, which has long been the principal gold mine in Venezuela, will shortly return to England.

Y. Fukushima was reported recently to be in San Francisco making shipping arrangements for steel and machinery ordered in the East.

John M. Fox has left Tonopah to take charge of mining operations in the magnetite field of New Jersey, with headquarters at Dover.

J. H. Lewis, formerly with the Nevada Consolidated Copper Co., McGill, Nev., is now connected with the Braden Copper Co., at Rancagua, Chile.

Albert Burch, of San Francisco, has resigned as manager of the Bewick, Moreing & Co. interests in California, and also as manager of the Plymouth Consolidated.

The Marquis of Queensbury, accompanied by H. Stanley Waugh the well-known African and Australian gold mining pioneer, passed through Toronto recently on his way to Alaska to inspect gold properties there.

Peter Nordstrom has returned from a trip of three months in the iron-ore district of northern Sweden. He superintended the installation of 16 Bucyrus electric shovels in the Kiruna mine of the Grangesberg company.

Roy F. Heath has resigned his post as chemist for the U. S. Mining Co. to open an assay office and chemical laboratory at White Sulphur Springs, Mont., taking advantage of the development at the new camps of Copper, Castle and Delpini.

John D. Pope, former general manager of the North Butte Mining Co., has been appointed manager of mining operations of the Boston & Montana Development Co., and will be elected a director of the company at the meeting of the board on Feb. 5.

J. R. Finlay has left for a prolonged Western trip. He expects to be in Globe, Ariz., beginning Jan. 26 for two or three weeks. After that he will be at Jerome for a good part of March. Thence he will proceed to California and finally will visit the Cœur d'Alene.

George S. Rice, chief mining engineer of the Bureau of Mines, has completed an examination of the Crow's Nest coal mines of British Columbia, at the request of the Canadian government. These mines are the most gaseous in the world, but Mr. Rice holds out hope that a method may be devised to work them at a minimum risk of life.

W. J. Loring, of Bewick, Moreing & Co., London, has taken charge of the interests formerly directed by Albert Burch, in addition to the operation and development of mines in Eldorado, Amador, Calaveras and Tuolumne Counties for the operation and development of which he secured the necessary investment in the United States since the beginning of the European war.

Obituary

Mark Nagle, a mining engineer, formerly connected with the Oliver Iron Mining Co. at Eveleth and Coleraine, who had been in the southwest several years, has been killed at Globe, Ariz., just how his relatives have not been advised. The body is being brought to Eveleth, Minn., for burial. He has a brother living in Superior, Wis., a sister living in Butte, Mont., and another sister living here.

August Raht, the well known lead-smelting expert, formerly with the American Smelting and Refining Co., died on Christmas day at the Palace Hotel, San Francisco, where he had made his home for some time. Mr. Raht was born in Germany, but spent the greater part of his life in this country. He was connected at various periods with the United Smelting and Refining Co., and with the Guggenheims at Pueblo, Colo., Aguascalientes, Mexico, and at Perth Amboy, N. J. A more extended notice will be published later.

Gen. Frank Hall, aged 82, died in Denver, Jan. 2. For the past 18 years he has been mining editor of the "Denver Post," and was widely acquainted among mining men, especially those of the pioneer and early periods. Aside from a general feebleness due to old age, he maintained his regular duties to the last. No illness affected him. He retired in normal health and passed away during his sleep. He was born in Poughkeepsie, N. Y., Mar. 4, 1835. When a young man of 25 he went to St. Louis and there joined a party of adventurous pioneers bound for Colorado. He was a contemporary of David H. Moffat. He became a man of public affairs, was a member of the first territorial legislature, territorial secretary of state, and acting governor. He obtained his title of "general" by reason of being adjutant-general of the Colorado militia during early-day troubles. In 1893 he was elected treasurer of Denver. In 1895 he became county treasurer. From 1895 to 1901 he labored on his "History of Colorado," a work so complete and authentic that he was thereupon made state historian. His personality is stated in the words of his most intimate colleagues—"A fine old gentleman." He looked, acted and lived the part. His funeral was conducted by the Masonic fraternity Jan. 4.

Societies

College of Mines, University of Washington, at Seattle, Wash., held a smoker and open house at the new mining experiment station of the U. S. Bureau of Mines, just established, on Friday, Jan. 12.

American Institute of Mining Engineers is preparing announcements of the details of the 114th annual meeting to be held at New York, Feb. 19 to 22 inclusive. Details of the program, as at present formulated, are noted on another page of this issue of the "Journal." All those interested in mining are urged to attend.

University of Washington, Seattle, Wash., calls attention to the fact that 45 men have enrolled in the 20th annual three-months mining session at the College of Mines. Their ages vary from 21 to 56 years, averaging 33 years. All but ten of the men have had mining experience. They register from all parts of the Pacific coast, from Arizona to Alaska. Quartz miners are in the great majority but several placer miners are present and a few coal men.

Engineers' Society of Western Pennsylvania held its annual meeting on Tuesday, Jan. 16, at its rooms in the Oliver Building, Pittsburgh. The retiring president, Samuel E. Duff, presented his annual address on the subject of "Our Society." The society will be entertained on Saturday evening, Jan. 20, by an address, accompanied by moving pictures, by H. W. Du Bois, of Philadelphia, the subject being "Hunting in Alaska with a Movie Gun."

American Institute of Mining Engineers and American Electrochemical Society will hold a joint meeting of their New York Sections at the Machinery Club, New York, on Friday evening, Jan. 26. An informal dinner will be served at 6:30 p.m. after which the session will begin. The speakers will be: Ligon Johnson, consulting attorney for the International Nickel Co. and the American Smelting and Refining Co., "The History and Legal Phases of the Smoke Problem"; W. W. Strong, of the Scientific Instrument and Electrical Machine Co. on the "Theoretical Aspects of Electrical Precipitation"; Linn Bradley, of the Research Corporation, on the "Cottrell Process in Practice." A number of others who have had a great deal of experience with this interesting problem have been asked to join in the discussion.

Industrial News

Yuba Construction Co. has just received an order from Mark G. Evans, of Denver, for an 8-cu.ft. gold dredge, electrically operated and digging 65 ft. below water line, for a property near Breckenridge, Colo.

Homestead Valve Manufacturing Co., of Pittsburg, Penn., has appointed the Seiger-Wabranin Co., Atlanta, Ga.; Joplin Supply Co., Joplin, Mo., and George T. Matthews Co., St. Louis, Mo., as representatives in the territories contributary to those cities.

Snyder Electric Furnace Co., Chicago, has recently supplied furnaces to the Haynes Steelite Co., Kokomo, Ind.: Pelton Steel Co., Milwaukee, Wis.; New London Ship and Engine Co., Graton, Conn.; Pratt & Cady Co., Hartford, Conn.; Dayton Steel Foundry Co., Dayton, Ohio; Chile Exploration Co., New York, and the Stearns-Roger Mfg. Co., Denver, Colo.

Trade Catalogs

Fairbanks Power Hammers. United Hammer Co., 141 Milk St., Boston, Mass. Catalog. Pp. 16; 3½x6 in.; illustrated.

"A Chain of Evidence." Morse Chain Co., Ithaca, N. Y. Publication No. 15 covering Small Power Drives. Pp. 20; 6x9 in.; illustrated.

Cement-Gun Construction Co., Chicago, has published an interesting booklet describing and illustrating "Gun-crete" work, which is a protective application of concrete or cement put on steel, iron or masonry or timber construction by means of the cement gun.

Western Electric Co. is sending out interesting literature regarding the Davis flood lamps manufactured by that company. Those lamps have proved useful for general lighting, and make possible satisfactory operations by night in quarries, construction work, etc.

Rock Drills, Air Compressors, Coal Cutting Machines, Etc. Sullivan Machinery Co., 122 S. Michigan Ave., Chicago, Ill. Catalog No. 110. Pp. 68; 6x9 in.; illustrated. This is printed in the Spanish language and can be obtained on application to the company.

Electrical Supply Year Book. Western Electric Co., Inc., 195 Broadway New York. This is the Third Edition of this book and follows the plan of uniform list prices with one basic discount enabling prospective purchaser to quickly determine the approximate price of any article. Pp. 1312; 7x10 in.; cloth; illustrated.

New Patents

Amalgamator. Rowe F. Lounsberry, Sheridan, Wyo., assignor to Mid-Continent Machinery Co., Sheridan, Wyo. (U. S. No. 1,211,729; Jan. 9, 1917.)

Blasting—System for Firing Explosives in Mines. Camden Eugene Knowles and Leroy Daniel Cornelius, Pittsburg, Kan. (U. S. No. 1,212,072; Jan. 9, 1917.)

Concentrating Table. Henry W. Faust, Grants Pass, Ore. (U. S. No. 1,210,778; Jan. 2, 1917.)

Concentrating Table. Emil Deister, Fort Wayne, Ind., assignor to Deister Machine Co., Fort Wayne, Ind. (U. S. No. 1,211,364; Jan. 2, 1917.)

Conveyor and Mixer. Charles H. Burgard, Leavenworth, Kan. (U. S. No. 1,211,398; Jan. 9, 1917.)

Conveyor—Mill Product Discharging Mechanism. William B. Newlon, Fremont, Neb., assignor of one-half to George A. Mead, Central City, Neb. (U. S. No. 1,211,743; Jan. 9, 1917.)

Decanting Apparatus. Julius H. Alpenfels, Denver, Colo. (U. S. No. 1,210,392; Jan. 2, 1917.)

Drill. Frank R Williams, Ottumwa, Iowa. (U. S. No. 1,210,747; Jan. 2, 1917.)

Drill Bit and sectional rod therefor. Russell S. Carter, Hewlett, N. Y., assignor to Ingersoll-Rand Co., Jersey City, N. J. (U. S. No. 1,211,080; Jan. 2, 1917.)

Drill Sharpener. Edward L. Oldham, Denver, Colo., assignor to The Denver Rock Drill Manufacturing Co., Denver, Colo. (U. S. No. 1,211,483; Jan. 9, 1917.)

Electrolytic Recovery—Method of recovering valuable constituents of Ores. Hermann G. C. Thofehrn, Pittsburgh, Penn. (U. S. No. 1,210,724; Jan. 2, 1917.)

Electrolysis — Process for the Production of Cuprous Oxide Electrolytically. Bertram Hunt, Glasgow, Scotland. (U. S. No. 1 212,062; Jan. 9, 1917.)

Flotation Process of Concentrating. Galen H. Clevenger, Palo Alto, Calif. (U. S. No. 1,212,130; Jan. 9, 1917.)

Gold—Vacuum Gold Separator. William Shore, Montesano, Wash. (U. S. No. 1,211,495; Jan. 9, 1916.)

Hydraulic Power Transmission. Gogu Constantinesco, London, England, assignor of one-half to Walter Haddon, London, England. (U. S. No. 1,211,679 and 1,211,680; Jan. 9, 1917.)

Iron Alloy. Fred C. T. Daniels, Natick, Mass. (U. S. No. 1,211,826; Jan. 9, 1917.)

Mine Car. James V. Clark, Davis, W. Va. (U. S. No. 1,211,089; Jan. 2, 1917.)

Mine Car—Door for side-dump cars. Alexander M. Gow, Duluth, Minn. (U. S. No. 1,210,462; Jan. 2, 1917.)

Mine Shaft Gate. John J. Collier, Irwin, Penn. (U. S. No. 1,211,412; Jan. 9, 1917.)

Placer Machine. James W. Woods, Grand Junction, Colo. (U. S. No. 1,211,518; Jan. 9, 1917.)

Rick Drill Hammer. Walter E. Kimber, Harlesden, London, England. (U. S. No. 1,212,141; Jan. 9, 1917.)

Smelting—Process of and Apparatus for Smelting Ores. George W. Wright, Deming, N. M. (U. S. No. 1,211 805; Jan. 9, 1917.)

Steel—Manufacture of Steel. Godfrey John Boyle, Chetwynd, West Riding, England. (U. S. No. 1,211,545; Jan. 9, 1917.)

Tunneling Machine. Dighton A. Robinson, Seattle, Wash. (U. S. No. 1,212,107; Jan. 9, 1917.)

Uranium Oxide—Process for the manufacture of uranium oxide. Harvey A. Seil, Pittsburgh, Penn., assignor to Standard Chemical Co., Pittsburgh, Penn. (U. S. No. 1,210,714; Jan. 2, 1917.)

Well-Drilling Tool. Hermann F. Schubert, Victoria, Tex. (U. S. No. 1,210,704; Jan. 2, 1917.)

Editorial Correspondence

SAN FRANCISCO—Jan. 10

Deepest Active Mine Shaft in Nevada at the close of 1916 was the Union on the Comstock Lode. The 2740-ft. point was reached with the unwatering pumps at the end of the last week in December. The hoisting of ore will be increased by the installation of the electric hoist which is being removed from the C. & C. shaft, where it had been in use for several years. Ore from the Sierra Nevada and the Ophir also is moved through the Union shaft. So the preparation for greater and faster hoisting is necessary to meet extraction that is now possible. The timbers in the winze below the 2700 level are found in good condition, although they were submerged in 1885. There are several other winzes to be unwatered, extending to the 3300 level and it is believed that the timbers will be found in the same state of preservation as in the 2700. If so it means a large saving in the cost of rehabilitation.

Liquid Chlorine is being used at the largest chlorination plant on the Mother Lode, owing to the increased cost of manganese dioxide. The Kennedy mine, the largest producer in Amador County, has adopted this method. The liquid chlorine is supplied from Niagara Falls, in cylinders containing about 105 lb. of chlorine, the total weight of container and material being about 190 lb. The Kennedy operates a 100-stamp mill and has the largest chlorination works in the state. It uses five to six cylinders of the liquid per month. The cylinders are returned to the factory for refilling. The liquid chlorine is under about 65-lb. pressure and upon opening the stop-cock the chlorine gas is released. The old method required the use of a generator which was loaded with sulphuric acid, manganese ore and salt. The new method does away with the labor of generating the gas and cleaning the generators. In addition to the labor saved the net cost of the chlorine is said to be less when bought in the liquid form.

Tungsten Highgraders Near Bishop have developed into common thieves who steal sacked concentrates instead of robbing the mines of high-grade ore. The owners of the Standard mines traced some of their stolen concentrate to the thieves' cache and recovered about $1000 worth. When the thieves called in a motor car to get their cache they were disappointed and in order to compensate themselves for the long trip across the Mojave desert they stole three 50-lb. sacks of concentrate from the mill and carried them to Los Angeles where they sold them to an assayer. The man who drove the motor, Robert Nichols, "snitched" and Edward Arnold, former Los Angeles policeman, and Henry Johnson, a miner who had worked at the tungsten mines, were arrested. It is believed these men are members of an organized gang of "highgraders" operating in southeastern California and western Nevada. During the tungsten boom at Atolia and Randsburg a good deal of "highgrading" was done and some ore stolen from warehouses; but stealing concentrates worth $50 a sack and hauling it 300 mi. in small lots is rather cheap "highgrading."

State Highway Lateral, connecting Jackson with Sacramento, is practically assured by the State Highway Commission in authorizing the acceptance of the offer of Amador County to advance $100 per mi. for the survey of the road from Jackson due west via Ione to Clay, a station on the Southern Pacific R.R. in Sacramento County. The air-line distance is about 22 mi.; from Clay northwest to Sacramento the air-line distance is about 25 mi. The distance to be surveyed is greater between Jackson and Clay, owing to the foothill elevations, but the whole distance between the county seat of Amador and the state capital should not be in excess of 60 mi. The portion of the proposed lateral between Clay and Sacramento will be built by the Sacramento Highway Commission. This assurance of highway outlet from the Mother Lode districts in Amador County is a fine thing for the mining industry in that section of the Mother Lode region. It will be a finer thing if the county supervisors will see the necessity and provide for repairs and reconstruction of roads within the county and especially along the Mother Lode running north from the Hardenburg, situated south of Jackson to the Plymouth Consolidated at Plymouth in the northern edge of the county. From Jackson south into Calaveras County there is also need for improvement. Both these counties could be greatly benefited by better roads between Jackson and San Andreas. Amador is the leading gold-producing county in the state and contains important agricultural regions. But in the matter of direct transportation the mines, the ranches and the towns are "off the map." The county is served by the Amador Central R.R. running from Galt, a station on the Southern Pacific, at the southern edge of Sacramento County about half way between Sacramento and Stockton, to Martell situated about a mile out of Jackson. And Martell is merely a station at the end of the line. No town or mine in the county is reached directly by railroad and only in the western side of the county are there even tolerable wagon roads.

BUTTE—Jan. 11

Large New Orebodies continue to be found in the lower levels of the Butte mines. The seeming inexhaustibility of Butte's mineral resources is an ever growing subject of surprise to those familiar with the fate of other camps. Time and again it has been predicted that before long the copper mines on Anaconda Hill would give out in depth and be forced to drop out of the list of active producers. But whenever such predictions seemed most likely to come true, a new strike was usually made in one of the old mines and was followed by similar strikes in adjoining claims, thus putting off the dreaded end to an indefinite future. Then came the rapid development of Butte's zinc resources that had lain dormant for years under the very nose of calamity prophets and experienced mining men. These resources bid fair to make Butte one of the largest zinc producers in the world and even in the absence of copper would stamp Butte as one of the leading camps in the country. As though this was not enough, recent development work in the eastern section of the camp brings new surprises every day in the showing of large and rich bodies of copper ore that threaten to rob Anaconda Hill of its well deserved fame. As though fearing the loss of its world-wide renown, the famous hill is again proving its worth by giving up some of its riches at the depths of two of the oldest mines in the camp. On the lower levels of the Leonard and Tramway mines, the Anaconda company is now opening up bodies of ore that for richness and size surpass the showing of the same veins on higher levels. The developments there as well as on the lowest levels of the High Ore, the Original and other deep mines on Anaconda Hill indicate that the hill's future as a copper producer is assured for some years to come. The vein on the 2800 level of the Leonard mine shows a width of 50 ft. and contains ore running from 2 to 7% copper. The orebody developed in the Tramway mine is said to be over 100 ft. wide running from 3½ to 4% copper. The finding of such bodies at these depths means much to Butte, as comparatively little ore has so far been mined between the 2000- and 2600-ft. levels, leaving a great area of unexplored ground from the 2600- to the 3800-ft. levels, the lowest point to which the North Butte company's Granite Mountain shaft now runs. What this area may hold is impossible to tell, but the recent discoveries in the Leonard and Tramway mines give ground for great expectations.

DENVER—Jan. 10

Colorado Metal Mining Association is holding its annual convention at the Brown Palace Hotel. Pres. Bulkeley Wells, in his opening address, assailed the state tax commission's plan to raise general revenues through an increase in the assessment on metal mines. He also objected to the campaign being made by labor organizations to increase the benefits accruing to workmen under compensation laws that were enacted by the legislature two years ago. For several years the association has sought to take action concerning the business methods pursued by some of the custom-ore purchasers, particular charges being aimed at the American Smelting and Refining Co. Anticipating resolutions at this convention, there is a strong attendance of representatives of custom plants of all sorts. After stormy debate the association passed a resolution suggesting that the present legislature appoint a commission of experts to analyze the custom-ore business in this state, this to be known as the Colorado Ore Sales Commission. This group of experts is to be named by a committee of nine, three of whom shall be appointed by the Colorado Scientific Society, three by the Colorado Chapter of the American Institute of Mining Engineers, and three by the Colorado Metal Mining Association. The experts to be selected by this committee must qualify as follows: One a graduate mining engineer of 10 years' experience, one a well-known mine operator, and one a reputable, professional statistician and accountant. This commission is to be given power to examine ore-purchasers' "books and records and and to collect, arrange and publish the data by them collected and their conclusions and recommendations as to the proper, practical and legislative action to be taken." When such report is made, the association will introduce legislation putting the purchase of ores under the control of the state Public Utilities Commission.

SALT LAKE CITY—Jan. 12

Tintic Mine Dividends are beginning to contribute to Utah's mine profits for 1917, three mines from the Tintic district having just declared dividends. The Dragon Consolidated will pay 1c. a share or $18,750 on Jan. 20, this being the first payment by the company; in December 152 cars of ore were shipped, total shipments for 1916 amounting to 1418 cars, much of which was iron ore desired by the Salt Lake Valley smelteries. The Iron Blossom has declared a dividend of 10c. a share payable Jan. 25; the amount is $100,000, and brings the total to date to $2,950,000, or $2.95 a share; shipments for the year just ended were 1144 cars as compared to 1067 cars in 1915. The Chief Consolidated has declared a quarterly dividend of 5c. a share or approximately $44,150, bringing the total to date to $571,000, or about 60c. a share; December shipments amounted to 195 cars, and the year's output amounted to 1868 cars; the property is one of the largest shippers in the Tintic district. With the dividend of $22,500 paid Jan. 15 by the Moscow in Beaver County, the state has four dividend payments to its credit thus far in the new year.

WALLACE, IDAHO—Jan. 8

The Rumored Electrolytic Zinc Refinery near Spokane is still being agitated. It is announced that a representative of that city is now in the East endeavoring to finance the enterprise. Several month ago a systematic canvass was made of the Cœur d'Alene district to determine the present and probable future production of zinc, and similar investigations were made in other sections of the Northwest and in British Columbia. The result was a very good showing of prospective business on paper to be attracted by an electrolytic plant at Spokane. With the old smeltery site on the Spokane River, 7 or 8 mi. below the city, and a valuable water right as a nucleus, the promoters were confident of interesting capital in the enterprise. It is now announced that the Washington Water Co., which owns all the available power sites in the vicinity of Spokane with the single exception of the one above named, has offered to furnish 20,000 hp. or more to the proposed zinc plant at a low rate, so low that the promoters have abandoned the idea of putting in their own plant. The success of the enterprise seems to be based chiefly upon its accessibility to the zinc mines of Idaho, Washington and British Columbia, which would give a substantial reduction in freight rates on ore without material disadvantage in the shipment of refined zinc. There is of course no disposition to discourage any enterprise which has for its purpose the advancement of the mining industry, but there are some features of the zinc situation in the Northwest that seem to be overlooked by the Spokane people and that appear to be a serious obstacle in the way of the success of the proposed enterprise. The Anaconda Copper Mining Co.'s name has been mentioned in this connection. This company has, however, just completed a large electrolytic zinc refinery at Great Falls, Mont., to treat ores from its own mines at Butte as well as that from other districts in the Northwest. On the surface it would appear that a plant at Spokane would have a decided advantage in bidding for the ores of the Cœur d'Alene and British Columbia on account of the short railroad haul, but the first essential to success of an electrolytic zinc plant is cheap electric power. No matter how low the Spokane rate may be, it cannot compete with the cost of power at Great Falls, where the Anaconda company practically owns the power plants through its interest in the Montana Power Co. Aside from the power advantages possessed by Anaconda, the Great Falls electrolytic zinc plant has the benefit of one of the greatest metallurgical organizations in the world, embracing the highest technical skill, experience and experimental facilities. The question now is: Can any inexperienced organization beat this at Spokane?

OATMAN, ARIZ.—Jan. 8

About 35 Properties are doing development work in this district. Two or three of the best prospects are still woefully mismanaged but most of them are doing their work efficiently. At least the honesty of their intent cannot be questioned and that is saying a good deal for a camp that has recently gone through a boom period. Several of these prospects are well equipped and under excellent management. Others are endeavoring to get along as best they can with second-hand equipment ill-suited to the purpose but the only thing available in the rush when work on these properties was started. Money, cold, hard cash, is what is required for the development of prospects. Oatman still offers an excellent field for mining development but the cash flows into the copper camps just now and the gold districts must await the return swing of the pendulum

to secure funds for the development of their prospects. One or two Oatman prospects are liberally supplied with money but not with technical talent. Unfortunately the art of raising money does not seem to be understood by some of the best managed prospects in the district, whereas some of those whose managements are most competent in raising funds do not secure the same competence in the technical direction of their properties. In the established mines, continued progress is being made. Tom Reed has opened a big reserve of low-grade ore in its Aztec and Black Eagle claims. At the eastern end of the Tom Reed property so many shafts have been opened that this section has been locally dubbed "Oil Well City."

BRAINERD, MINN.—Jan. 12

Cuyuna Range Shipments in 1916 totaled 1,727,240 tons of ore from the following mines, which include six new shippers: Kennedy mine, 166,914 tons; Croft (new shipper), 69,110; Meacham (new shipper), 25,207; Thompson, 185,931; Armour No. 1, 77,034; Armour No. 2, 341,190; Ironton, 51,768; Mahnomen (new shipper), 148,949; Pennington, 206,084; Cuyuna-Mille Lacs, 89,945; Sultana, 37,200; Mangan No. 1 (new shipper), 30,635; Mangan No. 2 (new shipper), 1000; Ferro (new shipper), 22,258; Hoch, 24,346; Hill Crest, 19,430; Rowe, 180,239, and Wilcox, 50,000 tons.

JOPLIN—Jan. 13

A $70,000 Steam Power Plant is being installed by the Oronogo Mutual Mining Co., at Oronogo. Power shortage in the Joplin district during the last year has curtailed production markedly at times. Besides the Oronogo Mutual, several other large mining companies, which have heretofore been depending on the local electric-power service, have seriously considered establishing their own power plants. The local electric-power company lately awakened to the fact that it had not kept pace with the increased activities of the district and is now making a serious effort to retrieve its position, but meanwhile the mining companies have been doing some planning of their own. Included in the Oronogo Mutual's new equipment is an Allis-Chalmers cross-compound Corliss steam engine, of the condensing type, directly connected with a 2600-cu.ft. compressor, also cross-compound, and the largest in the district. A 400- and a 350-hp. boiler will furnish steam. The company has a 1000-ton mill, three shafts for hoisting ore and one for men and steel.

Continued Ore Strikes by Drilling is turning attention more and more toward the Oklahoma section of this district. Indications now are that Baxter Springs, Kan., will likely be the nominal center of this activity, rather than Miami, or Commerce, Okla., the tendency being for travel and business to extend toward Joplin. Leases only partially developed are selling for more in this field than fully developed mines in the older portions of the camp. In one instance a company put down a single drill hole and then contracted with a party of Oklahomans for an optional purchase of the 40-acre lease for $80,000. Sales of 40-acre leases for $20,000 to $35,000 are almost common. Announcement was made today of the formation of the Tri-State Mining Co., incorporated under the laws of Oklahoma for $500,000; L. C. Church, of Joplin, head of the Welsh mines and numerous others in the Oklahoma field, is one of the principals in this company, which has 2000 acres of leases and has inaugurated a $100,000 drilling campaign. Numerous mining men in the Joplin and Webb City camps have moved to Baxter Springs to be nearer their work, and that town has doubled in population in the last six months. During the last week the Big Eight Mining Co. started a shaft 1½ mi. south of Baxter, and the latter part of the week the Continental Zinc Co., a Hayden-Stone interest, made a rich drill strike ½ mi. west of the town.

WASHINGTON, D. C.—Jan. 16

Increased Activity in Placer Mining is causing additional efforts to be made by the U. S. Geological Survey to secure complete figures with regard to the industry. Operators are being requested to report not only for their own properties but are asked to assist in keeping the mine list up to date by sending in to the Survey the names of new mines, prospects and reduction plants of which they have local knowledge. Entirely independent of this annual collection of statistics the Survey recently made a separate canvass of operators of placer mines to obtain material for a special report. Failure to receive the additional information requested for this purpose has made it necessary to hold in abeyance the work on a special bulletin.

Smelting Fumes may be studied by the U. S. Bureau of Mines. To prevent duplication of effort in the study of problems involving the elimination of the recovery of sulphur-dioxide gas from smeltery fumes, a plan is on foot for the coöperation or the Bureau of Mines with the smelting interests. The proposition has been submitted to the smelting companies asking for their coöperation in the establishment of a laboratory at the Bureau of Mines experiment station at Salt Lake City where the efforts of those most vitally concerned could be united in attempts to solve the smoke problem. During the last four years the metallurgical section of the Bureau of Mines has been studying this problem. Work in this connection has composed the greater part of the activities of the Bureau of Mines experiment station at San Francisco. This work has been on a laboratory scale but another line of investigation, consisting of experiments under more nearly practical conditions, also has been pursued by the Bureau. This work was begun at the Panama-Pacific Exposition and has been continued by the Bureau of Mines at the University of California. By securing the financial assistance of the smelting companies, as well as their technical counsel and assistance, and by conducting the experiments in a smelting center, it is believed much more progress can be made in the study of the problem. The financial contributions of each smelting company are to be based on the tonnage of sulphide ores handled. In order to perfect the plan each of the smelting companies has been asked to designate one of its technical staff to act as a member of the committee in charge of the arrangements.

TORONTO—Jan. 13

Mining Legislation of importance is likely to come up at the next session of the Canadian Parliament which opens on Jan. 18. In addition to the nickel question which will form one of the leading issues, government measures are foreshadowed looking to the encouragement of lead, copper and zinc refining in order to strengthen the resources of the empire in time of war. Inquiries into the present condition and needs of the metallic industries have for some time been carried on by officials of the finance department. It has not been announced what form the assistance to be given to the refining industries may take, but it will probably include liberal bonuses.

Selection of Nickel-Refining Site by the British America Nickel Corporation, Ltd., has not yet been decided. Much difficulty has been experienced in finding a site which, while suitable in other respects, will enable them to obtain an adequate supply of electric power. The sites considered desirable in the neighborhood of Welland would have served the purpose a year or two ago, but latterly the demand for electric power in the localities served by the provincial hydro-electric commission's lines has increased so rapidly that the supply is inadequate for present consumers, and large additions to the plant are to be made. Meantime the construction of the refinery is delayed until the company can be assured of an adequate supply of electricity.

The Mining News

ARIZONA

Cochise County

CALUMET & ARIZONA (Douglas)—December output at smeltery from company ores was approximately 7,000,000 lb. About 3,000,000 lb. was produced from custom ores; considerable proportion of custom output was from Shattuck Arizona and United Verde Extension ores.

Gila County

OLD DOMINION EXTENSION MINING DEVELOPMENT CO. (Globe)—This extensively named company has added several outlying claims to its 600 acres. Copper-silver ore reported opened in Sea Bird and Cuprite shafts. Expect new interests to augment development.

Graham County

ARIZONA MAYFLOWER (Duncan)—Sinking Wampo shaft to 500 ft. Laterals will be run at each 100 ft.

Mohave County

OATMAN COMBINATION (Oatman)—Crosscutting and drifting at 500-ft. level.

GOLD ROAD BONANZA (Goldroad)—Station at 550 level completed. Drifting to explore vein will be started after short crosscut is driven, vein having pitched out of shaft. E. M. Rogers, superintendent.

UNITED EASTERN (Oatman)—Mill started on Jan. 4 instead of New Year's day as previously announced. Joe Perizzo, the original locator of the United Eastern ground, blew the whistle signaling the starting of the machinery. J. A. Burgess, superintendent.

MURDOCK MINING AND MILLING (Oatman)—This prospect, one of the best equipped and best-managed in Black Range section, has installed pump to handle water flow recently encountered and is crosscutting from the 300 level. Has 40-hp. Fairbanks-Morse hoist, 60-hp. engine and 350-cu.ft. compressor. S. R. Porter, superintendent.

TOM REED (Oatman)—Pumping plant installed at Aztec shaft, with capacity of 600 gal. per min., and sinking will be resumed. Pending installation of aërial tramway, a White truck will be used to transport ore from Aztec shaft to the mill. Mill now treating 140 tons daily and $60,000 is being spent to double capacity. E. M. Rabb, superintendent.

Maricopa County

YOUNG MINES CO. (Phoenix)—This company raising funds to erect a 350-ton mill to treat the low-grade gold ore of the Mammoth group, 20 mi. east of Mesa. George U. Young, president and manager.

Pima County

TUCSON ARIZONA COPPER (Tucson)—This company is shipping daily from Crepin group in Silverbell district about 40 mi. from Tucson. Now shipping to Copper Queen works but has recently entered into contract to ship to American Smelting and Refining Co. plants; Sasco smelting only 20 mi. from mine.

Pinal County

MAGMA SUPERIOR COPPER CO. (Superior)—Samuel Newhouse, of Salt Lake City, has taken control of this property south of the old Lake Superior & Arizona holdings.

Yavapai County

CALUMET & JEROME (Jerome)—Sinking new three-compartment shaft 100 ft. east of main fault; now down 85 ft.; three shafts working.

GADSEN COPPER (Jerome)—Three-compartment shaft being sunk on this company's Monster group.

JEROME VERDE (Jerome)—Shaft about 715 ft. deep. Diamond drilling in progress in crosscut from 1400 level of United Verde Extension workings.

BEE HIVE (Congress Junction)—Equipment, including engine, compressor, drills and drill sharpener, being transported from railroad to this gold mine. Three oreshoots recently cut on level 250 ft. above main tunnel.

CALIFORNIA

Amador County

ARGONAUT (Jackson)—The 800-ft. tramway from mine shaft to new mill completed. Mill nearly finished; 20 new stamps installed.

SOUTH EUREKA (Sutter Creek)—Orebody in winze below 2,900 level showing well. Sixty stamps dropping at this mill and 20 stamps at the Oneida. W. H. Schmal, superintendent.

ONEIDA (Sutter Creek)—Orebody recently disclosed on 2600 level has broadened to 30 ft. and is exposed for about 200 ft. in length. Preparing to sink on the ore.

CONSOLIDATED AMADOR (Sutter Creek)—Water lowered to 1,300-ft. point; new change house under construction; ore bins nearing completion; plans for mill being considered.

SOUTH KEYSTONE (Amador)—Construction of surface plant progressing steadily; engine house, compressor room and some other buildings completed and installation of electric hoist begun. Unwatering of the North Star shaft will soon be started.

CENTRAL EUREKA (Sutter Creek)—Deepening of shaft nearing the 3300 level. Contract let at reported rate of $21 per ft., the company furnishing engineering work and all tools and supplies except powder. Donkey engine at the 3100 level used to hoist rock and water, and to lower timber and supplies.

KEYSTONE (Sutter Creek)—Hoisting of ore resumed Jan. 2 and stamps began dropping Jan. 3. Since labor strike in September, company has been repairing and retimbering shaft from collar to 400-ft. station, enlarging shaft stations and putting in concrete floors and various safety devices. The mine was not affected by the labor strike, as the men were receiving a bonus of 25c. a day for making extra progress in development, but this work was completed shortly after the strike was declared and then active extraction and milling were held in abeyance and advantage taken of the opportunity to put shaft and stations in order. C. R. Downs, manager.

Butte County

BUTTERFLY (Oroville)—Gravel cleanup while taking out the old tunnel head said to have made exceptional yield. Situated in Morris Ravine near Table mountain. W. T. Baldwin, manager.

Calaveras County

MORGAN (Carson)—Reported that W. J. Loring has optioned this old mine, an early-day producer owned by Senator James G. Fair. Has been idle for many years. A few years ago "highgraders" robbed the mine of several thousand dollars of gold, proving that it was not worked out as had been reported. The mine was first worked by Mexicans, then by Frenchmen and was occasionally visited by Joaquin Murietta, the noted Mexican bandit. Mr. Loring now has under option a chain of properties extending from Carson Hill to the Stanislaus River, a distance of about 3 mi.

Eldorado County

WESTERN STATES GAS & ELECTRIC (Placerville)—Water system of the Placerville Gold Mining Co. has been transferred to the power company for $108,750; for smaller interests in the water system, $81,250 was paid.

SIERRA SLATE (Placerville)—Again reported that Eureka quarries at Slatington will be reopened and operated by this corporation which is said to include William Gamble of the Broadway Trust Co. and George Carr of the Colonial Bank of New York. Equipped with buildings, tramway, water and electric lights.

Plumas County

WALKER COPPER (Portola)—Mill now treating 125 tons daily.

JAMISON (Johnsville)—Employing about 40 men in mine and 20-stamp mill; George S. Redstreake, superintendent.

STANDARD (Johnsville)—Completed restraining dam consisting of wire-net "baskets" filled with rock and earth. Ditch and pipe line also finished. Ready for spring operations.

PLUMAS-EUREKA (Johnsville)—Recently acquired by Eastern men who have also bonded Blue Nose Channel; driving long tunnel on latter and 1,000-ft. inclined raise on Eureka to tap low-grade orebodies or upper levels.

ENGELS COPPER CO. (Keddie)—It is expected to increase present 500-ton concentrating plant to 2000 tons, the first unit of the addition to be ready for operation about July 1. Electric power now supplied by the Great Western Power Co. will be augmented by transmission line from Las Plumas power plant.

Shasta County

COLMA COPPER (Redding)—Preparing for development; situated southeast of Mammoth mine; owned by M. E. Dittmar.

FOREST QUEEN (Bayles)—Manganese Co. of California opening manganese deposit; employing 40 men; main office, San Francisco.

MEARS CREEK ASBESTOS (Hazel Creek)—Ten men employed; product to be hauled to Sims station on Southern Pacific; H. T. Mecum, manager.

POTOSI (Redding)—Being unwatered and prospected on surface; situated near Muletown; formerly owned by Senator Jones; A. S. Howe is present owner.

NORTH STAR (Ydalpom)—Prospecting in progress under management of M. E. Dittmar of Redding. Near Bully Hill mines; surface indications of copper, gold and silver.

SUMMIT MINING (Mammoth)—This copper property in which Stauffer Chemical Co. of San Francisco is said to be interested, worked under lease by J. E. Reid; ore to be shipped to Kennett.

REID (Whitehouse via Keswick)—Producing 75 tons a day of fluxing quartz for Mammoth smeltery; shipped by bucket tramway across Sacramento River and loaded into Southern Pacific cars; 70 men employed. H. J. Sallee, manager.

Sierra County

HILO (Downieville)—Large block of pay gravel struck by Bernhardt Bros., in ground partly worked by former owners.

WIDE AWAKE (Downieville)—Main tunnel in 250 ft., and raise being driven to work rich gravel recently found. Under bond to Thomas Wilson.

YORK-FINNEY (Downieville) — Shaft being sunk, cut several shoots containing free gold and sulphides. At 100 ft. drifting to be begun under Yuba River to catch bonanza shoot tapped in old workings. Operated by Finney Mines, Inc., under option. G. B. Morse, superintendent.

Siskiyou County

HYDRAULIC MINES in the Salmon River district are operating on a large scale and have an abundance of water for a long season. Davis Consolidated, Michigan Salmon, Forks of Salmon and other mines of smaller size are active.

IN HUMBUG DISTRICT, a nugget valued at $135 taken from the tailing of the Old Tom mine by John C. Whitney. Another nugget, valued at $180 was recently taken from near the same point on Humbug Creek, which yielded rich gravel in the early days of Siskiyou County.

COLORADO

Clear Creek County

FOSTORIA (Idaho Springs)—This Gilson Gulch property is being developed under management of William Strasser. Small high-grade vein opened.

YUKON (Alice)—Development being performed by Consolidated Mines Development Co. with 15 men. One heading on 130-ft. level opened 6-ft. vein of milling ore containing 3-in. streak of smelting ore assaying 14 oz. gold to the ton. The other heading on same level opened 3-ft. vein assaying $36 a ton. Crosscut is being driven to intersect the Silver Moon vein.

GEM (Idaho Springs)—Mazda Leasing Co., in driving west on the 1400-ft. level, opened a body of ore 9 ft. wide, which is being shipped to Newton mill for treatment. G. W. Ford Lease, operating through the Frater shaft, has cut 14-in. vein of $140 ore; discovery 400 ft. below surface. Clear Creek Leasing Co., carrying on development west of the tunnel, has small vein of payable ore. Osterman & Co. have cut a vein above the Ford Lease, 240 ft. below surface.

Ouray County

VERNON (Ironton)—Shaft sunk to depth of 276 ft. Gray-copper orebody opened at 50-ft. level and on 100-ft. level has just been crosscut for 22 ft. Shaft being sunk to 300 ft. where further drifting and crosscutting will be done.

San Juan County

DECEMBER SHIPMENTS from Silverton, crude ore and concentrates, were as follows: Sunnyside and Iowa-Tiger, 21 cars each; Green Mountain, 18; Silver Lake custom mill, 10; Congress, 9; Gold King, 8; St. Paul and Kittimac, 7 each; Silver Ledge, 6; S. D. & G. lease, 5; Hamlet, 3; Genessee, Highland Mary and Bagozzio, 2 each; Dives Leasing Co., Mayflower, Intersection, Barstow, Champion, Contention, 1 car each; miscellaneous small shipments, 10 cars; total, 137 cars. Shipments of concentrates from Silverton for the year amounted to 42,705 tons.

HAMLET (Howardsville)—Crew employed on development is keeping the mill operating one shift. Work will continue through winter.

ALFADOR (Silverton)—Comfortable quarters erected and plans made for development through winter months. Peter Carlson, superintendent.

SILVER LAKE MILL (Silverton)—This custom mill is successfully treating ore from the Champion mine at Silverton, the Genessee property at Red Mountain and the Green Mountain and Pride of the West properties in Cunningham Gulch.

TRILBY (Silverton)—Property on King Solomon Mountain is being developed by Daniel MacLean and associates, of Durango. Crosscut tunnel has intersected a 16-ft. vein of low-grade ore carrying gold, silver, copper and lead. Blacksmith shop, bunk house and boarding house erected at portal. O. Reynolds, superintendent.

San Miguel County

SANTA CRUZ (Ophir)—Being developed under bond and lease by Wichmann & Co. Payable ore opened and a carload averaging $30 shipped from development.

HIGHLAND MARY (Ophir)—A 7-ft. vein of milling ore opened and production from development is keeping 10-stamp mill in operation.

TOMBOY (Telluride)—In December, mill ran 29 days crushing 13,000 tons; bullion yield $38,100 and concentrates $55,100; operating profit $28,400; profit from other sources $1500.

CARBONERO MINES AND DEVELOPMENT (Ophir)—Main vein recently intersected 2700 ft. from portal of the 6x8-ft. crosscut tunnel, and 1200 ft. below the surface. Vein where cut shows 8-in. streak of payable ore. Development is 650 ft. below lowest former opening; raise will be driven to connect with upper workings and drifts will be started east and west on the vein. George B. Pickett, manager.

IDAHO

Shoshone County

HECLA (Wallace)—Company recently completed addition to mill which increases capacity from 450 to 650 tons per day. Has also taken lease on Marsh mill, 9 mi. from mine at Burke, which adds over 200 tons to milling capacity, or a total of about 900 tons. Two independent veins parallel to original sufficiently developed during last year to justify expectation that they will prove as rich and extensive as the first.

SUNSET BANNER (Wallace)—Taken under bond by Jesse Coulter for $100,000, first payment of $10,000 due Sept. 1 and balance in periods of six months, final payment of $25,000 being due Sept. 1, 1919. Work begins at once on deep crosscut to vein in which lead and zinc were found in two upper tunnels. Property consists of six claims on Beaver creek. Owned in Wallace and Spokane.

NABOB (Kellogg)—Proposition from Robert Sweeny, of New York, to form new corporation to include the Nabob, Denver (under bond to Nabob company), option on Sidney held by Sweeny, and several other claims, submitted to stockholders for ratification. Fine body of lead and zinc developed on Denver, and if proposition is accepted, $150,000 will be provided at once to equip property with mill and tramwey.

MICHIGAN

Copper

ISLE ROYALE (Houghton)—Now shipping from 3100 to 3200 tons to mill daily.

HOUGHTON (Houghton)—Yield for December was 17½ lb. of refined copper per ton.

TAMARACK (Calumet)—President C. S. Smith announces arrangements being made for sale of property to responsible organization for $4,000,000—equivalent to $66 per share.

NEW BALTIC (Houghton)—Now that compressor has started, sinking will be carried on at rapid rate; drilling heretofore done by hand drills.

WHITE PINE (Ontonagon)—Experimental flotation plant will be installed at once to recover copper left in the sands, which contains from 12 to 15 lb.

COPPER RANGE (Painesdale)—Has purchased from the South Range Mining Co. 52,000 acres of land extending from Lake Gogebic nearly to Houghton; some drilling understood to be contemplated.

MASS (Mass)—Yield of 16½ lb. of refined copper per ton was the record of this property last year. Getting more men, and gaining gradually in tonnage. May start proposed new shaft in spring.

MICHIGAN (Rockland)—The Evergreen and Ogimah lodes, at this property, are encountering considerable mass copper. Recently, in one day, 800 to 900 lb. of mass copper was taken out on the Evergreen lode.

CALUMET & HECLA (Calumet)—Has installed a storage battery locomotive on 16th level of No. 15 shaft on the Osceola lode. If successful, this system of haulage will help to maintain tonnage in the spring, when many men will be returning to outdoor work.

HANCOCK (Hancock)—Tonnage mined in December 26,273 tons, an increase over November. Rock from Quincy shaft running about 19 lb. Considerable low-grade ore being taken out—with profit at the present prices—in order to get at the better grades.

FRANKLIN (Demmon)—Now putting in rope-haulage system on 31st level and expect to have 32nd level equipped similarly in about a month. Electric motor supplanting compressed-air engine on 32nd level. Exploratory work is being carried on at 26th, 27th, and 29th levels North.

Iron

MAITLAND MINING CO. (Palmer)—An open-pit mine is to be opened at the Volunteer. Low-grade silicious ore will be mined. Equipment purchased and ore will be taken out this year. Crushing plant ordered.

TRADERS (Iron Mountain)—A 10x12-ft. drift, being run 1000 ft. to the old Cornell mine, will be connected with surface by 10 or 12 raises. Ore will be milled from surface and taken through drift to shafts. About 10,000 tons of ore will be taken out in cutting the drift. Peninsular Power Co. extending its lines to mine.

CLEVELAND-CLIFFS (Ishpeming)—Power plant on Au Train river will in future send its current to Stephenson mine, Gwinn, instead of to Munising Paper Co.'s mill. Will provide 1000 hp. additional for use of mines. Twenty-six miles of pole line will have to be built. Company will then have three water-power plants supplying current for mine use.

MINNESOTA

Cuyuna Range

THOMPSON (Crosby)—One of the first open-pit mines on the Cuyuna range has ceased steam-shovel operations and is milling its ore.

SULTANA (Ironton)—Recently installed 3-ton Plymouth gasoline motor for stockpile work. Expects to stockpile 65,000 tons of ore during winter.

CUYUNA-MILLE LACS (Ironton)—Two drills are in operation exploring a new lease of ore recently discovered while crosscutting south of the present orebody for a new shaft site.

INLAND STEEL CO. has commenced stripping operations on the SW¼ of SE¼ of Sec. 2-46-29; this property is a state lease and will be known as North Pit of the Thompson mine. Drilling on the SE¼ of Sec. 1-46-29 has been discontinued, after having indicated 1,200,000 tons of ore averaging 54% in iron (dry).

Mesabi Range

HILL ANNEX (Marble)—All stripping work stopped for winter. Ore exposed in several places. First shipments to be made during coming summer. Equipment to be overhauled before spring.

LONGYEAR-BENNETT (Keewatin)—Another pit mine to be opened near the Bennett. Pit will be 1100 ft. long and 600 ft. wide. Depth of overburden about 42 ft. Will be stripped by Butler Bros. Contract calls for removal of 1,000,000 cu.yd. of dirt.

PICKANDS, MATHER & CO. ore shipments from the Mesabi. Range mines in 1916 were as follows: Mohawk mine, 185,313 tons; Hudson, 110,510; Bangor, 223,576; Belgrade, 155,284; Corsica, 292,228; Elba, 145,149; Malta, 66,573; Jean, 3927; Albany, 468,291, and Utica, 324,900 tons.

MISSOURI

Joplin District

BIG CHIEF (Tar River, Okla.)—Has sunk into rich ore in new shaft just north of Picher mines.

SHORT (Joplin)—Erecting new mill on Scott land, near Baxter Springs, Kan.

MARY L. (Joplin)—New mill on Missouri Lead and Zinc ground almost completed. Rich shallow formation, 41 to 70 ft.

BIG EIGHT (Galena)—Started shaft sinking on tract just south of Baxter Springs, Kan., and will build mill. J. L. Williams, manager.

EIGHT FRIENDS (Miami, Okla.)—Has taken over lease on Denver-Miami ground northeast of Miami and will operate on percentage basis.

SCOTT-EAGLE (Quapaw, Okla.)—Has promising prospect bewteen Quapaw and Century. For present only hand jigs used in ore cleaning. Eight installed.

PLAYTER BROS. (Joplin)—Will build mill on 20-acre lease of Connor land in Leadville Hollow, northwest of Joplin. Recent drilling shows rich shallow deposits.

STRICKER & CO. (Tar River, Okla.)—Rich drill strike on new tract southwest of Picher, Okla. Drilling showed rich cuttings 35 ft. Mr. Stricker is manager for the locally famous Blue Goose mine.

ADIRONDACK (Joplin)—New mill started in operation. Capacity 300 tons per 10-hr. shift. A 120-hp. Diesel-type engine supplies power for mill and electric-lighting plant. Two field shafts with 250- and 300-ton hoppers. Ore found at two levels, 125 and 170 ft. W. H. Roberts, general manager.

MONTANA

Mineral County

TARBOX (Saltese)—Force of 30 men working. In crosscutting, making from 5 to 7 ft. a day. Jackhamers have been replaced by water Leyners for sinking and crosscutting.

RICHMOND (Saltese)—Shipping a car of copper ore per day. Eastern men now interested and property is to be exploited on a larger scale.

LAST CHANCE (Saltese)—Some high-grade silver-lead ore developed lately and regular shipments are now being made. Adjoins Tarbox on west.

Silver Bow County

BUTTE & LONDON (Butte)—Rumors of shutdown have called forth expression on the part of Butte stockholders that they would be willing to stand an assessment if necessary to continue work.

TUOLUMNE (Butte)—Production at company's old property on Anaconda Hill amounted to 3000 tons of ore in December; crosscut started on 2600 level to develop north split of Jessie vein, never prospected heretofore. Development work in eastern section has proved a 5- to 9-ft. orebody in Spread Delight vein.

DAVIS-DALY (Butte)—In developing Hesperus vein on 1400 level of Colorado mine, company has opened richest orebody of the mine. Assays taken over a width of 11 ft. are said to show 32.4% copper and about 20 oz. in silver. On the 2500 level an orebody has been developed showing 12% copper. New hoist will be ready for operation soon.

NEVADA

Esmeralda County

ATLANTA (Goldfield)—Arrangements made for treating its low-grade copper-gold ore at new flotation plant of Goldfield Consolidated.

GOLDFIELD CONSOLIDATED (Goldfield)—Company announces that certain portions of property will again be opened to lessees.

JUMBO EXTENSION (Goldfield)—Optioned group of copper claims on Copper Mountain in Mineral County, about 45 mi. from Luning. Crew of 10 men employed in preliminary development.

Humboldt County

ROCHESTER MINES CO. (Rochester)—Expect to have aërial tramway in operation early in February. Production for year 1916 estimated at $373,857.

LOVELOCK QUICKSILVER CO. (Lovelock)—Regular shipments of about 10 flasks per week being made to San Francisco; product of recently erected five-ton furnace.

IVANHOE CINNABAR CO. (Battle Mountain)—New furnace with capacity of about 10 tons per day being erected on Butte Creek. About 15 men employed.

HUMBOLDT CONSOLIDATED MINING CO. (Oreana)—Two shifts driving long tunnel projected to cut vein system of La Toska mine at depth of 1300 ft. Face nearing objective. John Newman, superintendent.

HUMBOLDT COUNTY TUNGSTEN CO. (Lovelock)—New mill running smoothly, though at reduced capacity due to storms interrupting ore hauling. Concentrates of approximately 70% tungstic acid content.

Nye County

TONOPAH ORE PRODUCTION for week ended Jan. 6 was 7461 tons valued at $134,298, compared with 3431 tons for week previous. Producers were: Tonopah Belmont, 2251 tons; Tonopah Extension, 2240; Tonopah Mining, 1350; Jim Butler, 700; West End, 298; Rescue-Eula, 190; Halifax, 55; McNamara, 52; miscellaneous, 325 tons.

JIM BUTLER (Tonopah)—Dividend No. 4 of 10c. per share was declared payable Feb. 1. Involves a disbursement of about $171,802.

MONITOR-BELMONT (Belmont)—At Highbridge mine, the 75 level has been cleaned and a wide vein disclosed; new hoist installed and compressor and drills ordered. Belmont incline retimbered to the 200 level of the Belmont vertical. Milling operations seriously interfered with by snows in October and December but the mill put through 17,000 tons in last half of year. From now on mill will be supplied with ore from Highbridge mine. Wilson W. Hughes, superintendent.

Storey County

ANDES (Virginia)—Saved 78 cars of $8.40 ore from 350 level.

COMSTOCK PUMPING ASSOCIATION (Virginia)—Good progress made lowering water through the Mexican and Ophir winze; water now stands 80 ft. below 2700 station. Winze still in excellent condition.

UNION, SIERRA NEVADA, MEXICAN (Virginia)—No work done underground since Dec. 31, on account of tearing out surface hoist at Union shaft and making necessary alterations for installing new electric hoist.

NEW MEXICO

Grant County

FIERRO COPPER CO. (Fierro)—New flotation by Phoenix and Jerome, Ariz., men to develop Davidson group, from which 75 cars of ore have been shipped.

SOUTH DAKOTA

Black Hills District

SHAMROCK (Deadwood)—In cleaning out old workings, encountered silver ore assaying as high as 118 oz. per ton.

TROJAN (Trojan)—Mill is being improved by addition of tube mill and equipment for handling slime. Good tonnage of custom ore is being received since facilities for its handling have been put in.

AMERICAN MINING CORPORATION (Flatiron)—New company, managed by F. C. Bowman, has taken over Alder Creek mine and Bismarck mill. Mill running at part capacity, but by spring will be working full time.

UTAH

Juab County

SHORTAGE OF COAL for several weeks has somewhat hindered operations. Trouble due to transportation.

EUREKA KING (Eureka)—Shaft being sunk at this property adjoining Chief Consolidated; down 20 ft.

YANKEE (Eureka)—Shipment of high-grade silver-lead ore made from Humbug workings. Ore drifted on for 175 ft. Development being done in Beck Tunnel quartz vein. Lessees recently shipped car of high-grade zinc ore.

TINTIC STANDARD (Eureka)—Stoping started on orebody opened on 1600 level. Three shifts working. Nearly a car daily being mined. Ore is lead-silver. New shaft down 300 ft.; recently installed hoist working satisfactorily. New shaft is 1700 ft. from old, where lead-silver orebody was opened.

EAGLE & BLUE BELL (Eureka)—New body of shipping ore carrying lead and silver opened on 1000 level in new teritory, 900 ft. north of shaft, and about 700 ft. from any other known orebody. Has been followed 30 ft. Development being done on 700-, 1550- and 1875-ft. levels. Output for 1916 was 470 cars, estimated at 20,000 tons. Employing 125 men.

Salt Lake County

OHIO COPPER (Lark)—Minerals Separation flotation unit of 200 tons capacity ordered; expected to be in commission in 90 days. Alfred Frank, general manager.

MONTANA-BINGHAM (Bingham)—Face of tunnel in 4750 ft. Last 150 ft. in hard quartzite. Progress at present 12 ft. daily.

MAXFIELD (Salt Lake)—Three to four feet of lead-silver ore opened in drift from incline. Property in Big Cottonwood. Shipment being made by bobsled.

GARFIELD CHEMICAL AND MANUFACTURING (Garfield)—New sulphuric-acid plant operating, now producing about 50 tons daily. Capacity to be 100 to 150 tons.

EMMA COPPER (Alta)—Several cars of shipping ore accumulated. Taken out in development from winze below Bay State tunnel. Road broken to new ore bin.

CARDIFF (Salt Lake)—Daily shipments of about 100 tons of ore being made. Ore at present hauled in bobsleds to Murray. Snow 8 to 10 ft. deep at mine.

SELLS (Alta)—Car of ore shipped from No. 1 raise, up 200 ft. above main tunnel. Another awaiting shipment. Principal value in silver. Annual meeting to be held Feb. 13.

MICHIGAN-UTAH (Alta)—Ore hauling resumed between lower end of tramway at Tanner's Flat and Wasatch. Raise from Copper Prince tunnel producing shipping ore of good grade. Triangle lease also shipping. Ore principally lead-silver.

Summit County

JUDGE MINING & SMELTING (Park City)—Company's new zinc plant expected to be ready for operation soon after Feb. 1.

THREE KINGS (Park City)—Winze from bottom level down 140 ft., giving vertical depth of 775 ft. Mineralized seams carrying pyrite cut. W. R. Elliott, manager.

NEW QUINCY (Park City)—At annual meeting Jan. 9 directors elected were: H. G. McMillan, N. B. Johnson, A. L. Thomas, W. S. McCornick, F. J. Hagenbarth, W. R. Hutchinson, and Herman Bamberger.

SILVER KING CONSOLIDATED (Park City)—New ore opened between 1550- and 1625-ft. levels, north of No. 2 raise. Present output 50 to 60 tons shipping ore daily. New tramway operating, and keeping property open in spite of snow-blocked roads. Thaynes Cañon tunnel in 1550 ft. Some mineralization encountered.

Tooele County

HAULING CONDITIONS IMPROVED by recent snowstorms in Dry Cañon. Roads are good from cañon to railroad station at Stockton. Ore being hauled by bobsled from Hidden Treasure and Mono.

Utah County

ROADS INTO AMERICAN FORK broken, and work is being done at Earle-Eagle, Bay State, Dutchman, South Park, Silver Dipper, Red Cloud, Whirlwind, Pacific, Miller, Hill and Texan.

FISSURES EXPLORATION (American Fork)—Mill in successful operation, treating 65 tons daily. Eight tons concentrates carrying 35% lead and 20 oz. silver produced. Thirty men employed.

MILLER HILL (American Fork)—To raise funds for development 350,000 shares treasury stock offered to stockholders pro rata; all taken up. Full electrical equipment installed, and connections made with Utah Power & Light Co.'s line. A 1000-ft. tunnel being driven to cut large fissure productive in Pacific and Dutchman adjoining. There remain 300 ft. still to be driven and when fissure is cut there will be 600 ft. of ground to surface. Company controlled by the Knights.

WASHINGTON

TACOMA SMELTING CO. (Tacoma)—Company will soon start work on a new stack, 25x550 ft.

BRITISH COLUMBIA

GRANBY CONSOLIDATED (Vancouver)—December copper output, 3 219,000 lb.; for 1916, approximately 44,702,000 lb.

ONTARIO

TOMMY BURNS (Porcupine)—Sinking double-compartment shaft.

HARGRAVES (Cobalt)—Development will be started on main vein at 125-ft. level.

KERR LAKE (Cobalt)—Production in December was 190,160 oz. silver, as compared with 215,840 oz. in November.

LAKE SHORE (Kirkland Lake)—Issue of 20,000 shares of treasury stock at 50c. per share has been made.

SCHUMACHER (Schumacher)—The find on 200-ft. level, No. 4 shaft, developing into an important orebody having a width of 9 ft.

WEST DOME (Porcupine)—Drift on third level is now in 400 ft. and vein in the face averages 5 ft. There is ore on the dump and arrangements are being made to have it milled.

NEWRAY (Porcupine)—Crosscutting started at 400-ft. level to tap veins uncovered on surface. Shareholders will be asked to sanction increase of capital from $1,000,000 to $1 500,000.

NIPISSING (Cobalt)—During December company mined ore of estimated value of $259,836, and shipped bullion from Nipissing and customs ores of estimated value of $301,901.

HOLLINGER CONSOLIDATED (Timmins)—It is expected that a section of the new mill comprising 20 stamps will be in operation about Mar. 1. The new addition is covered in and interior work is being carried on.

HONDURAS

NEW YORK & HONDURAS ROSARIO (San Juancito)—Milled in December 11,600 tons yielding 182,000 oz. silver and about 1550 oz. gold. Greatest monthly tonnage ever milled. On the new Sabana Grande development, a 50-ton mill is to be erected.

PERU

CERRO DE PASCO (La Fundición)—Copper output in 1916 was about 71,000,000 lb. of which approximately 65,000,000 lb. was from company's own mines.

The Market Report

Metal Markets

NEW YORK—Jan. 17, 1917

There was a radical change in the complexion of all the principal markets last week, and in copper, zinc, lead and tin there were sharp advances.

Copper, Tin, Lead and Zinc

Copper—In our report of last week, it was intimated that the reselling movement looked as if it were at or near the end. This proved to be the case within the next day or two, and the reply of the Allies immediately following, indicating prolonged continuance of the war, produced a marked change in sentiment. Upon the buying by speculators to cover short contracts and the buying by uncovered consumers, the market advanced sharply. The aggregate of business was small, but it was larger and there was more inquiry and more interest generally on the part of consumers than during any week since the middle of December.

There is a strike at the Perth Amboy refinery of the American Smelting and Refining Co., which at this writing is still unsettled.

The reports in the newspapers of opening of negotiations by the allied governments for another large purchase of copper were based on a fabrication out of whole cloth by which the newspapers were misled. The origin of this report is said to be known.

Exports from Baltimore during the week included 423.5 tons of copper to France and 1156 tons to Russia.

Copper Sheets—Base price for copper sheets continues unchanged. The quotation is 42c. for hot rolled and 43c. for cold rolled. Wire is quoted on a base of 37c. f.o.b. mill.

Tin—The price advanced sharply from day to day on good buying, especially for spot and near-by delivery, while futures were neglected. The spot supply in the hands of dealers is small. At the opening of the week spot was 42¾c., and futures, 41¾c. At the close, spot was 44¾c., and futures, 42⅞c.

Lead—A good business was done, including some transactions in large lots for January delivery. In view of the shortage of available supply, that which was required could be obtained only at the full price of 7½c., to which the market advanced. Lead was sold for delivery from Western refineries to interior points at prices approximating the New York price. As early as Jan. 13 some business was reported done in St. Louis as high as 7½c. Scarcity of the brands of chemical lead made them especially strong. While the bulk of the business for last week was for January and February delivery, some producers entered into March contracts. Canada was again a buyer. There were some other foreign inquiries, but in the main the business of last week was domestic.

A factor in the present situation in the markets for both lead and spelter is without any doubt the delay in transportation from Western producing points to Eastern consuming points. Lead shipped from St. Louis in the first half of November had not been received in New York as late as Jan. 17. This is not an isolated case, but is what has happened in deliveries by a certain producer to numerous of its customers. The normal time of transit from St. Louis to New York is about two weeks. A large supply of lead and spelter bought by consumers must be locked in railway cars, and failure to obtain expected deliveries is doubtless contributory to the tightness of near-by positions.

Spelter—At the beginning of the week, January spelter was sold at under 9c., but on Jan. 12, some interests that had previously been sellers turned buyers and there ensued a sharp advance mainly on short-covering by speculators. There were, however, some transactions with consumers. The business of the week came to a moderate total in tonnage, which was made up by a lot of small transactions, scarcely any large lots being reported. On Jan. 17 first hands in the morning were asking 10c. for January delivery, 9¾c. for February, and 9½c. for March, but in the afternoon a slightly easier tone was reported.

The principal producers are holding high-grade spelter firmly at 16c., but small producers this week offered February-March delivery, guaranteed 99.0% zinc, at 14¼c.

Zinc Sheets—No change has been made in the market price of zinc sheets. Quotation is $21 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

Other Metals

NEW YORK—Jan. 17

Quicksilver—Unchanged at $80, with a fair demand. San Francisco reports, by telegraph, $79, market dull.

Antimony—Market slightly firmer at 14½@15c. January-February shipments from China 13@13½c., c.i.f., New York, duty unpaid.

Nickel—No change appears in nickel quotations. Price remains at 45@50c. per lb., with electrolytic commanding an additional 5c.

Aluminum—The aluminum market continues quiet with buyers scarce. Nominal quotations are at 60@63c. per lb. for No. 1 ingots, New York.

The Board of United States General Appraisers has decided that the failure of foreign manufacturers to conform to specifications in making metal goods cannot take such goods out of the regular provision, even though the merchandise is thus made useless for its original purpose. The case bringing out the ruling was an appeal by a company importing articles of aluminum and bronze which were not up to specifications and could not be used for the purpose for which they were made, wherefore the importers claimed the right to consider them as scrap aluminum and pay the duty as such.

Gold, Silver and Platinum

Gold—Bank of England gold reserve shows practically no changes, according to report of Samuel Montague & Co., London, Dec. 28, 1916. U. S. gold coin to the amount of $24,400,000 arrived from Canada and was deposited at the New York sub-treasury for account of J. P. Morgan & Co.

Silver—Owing to lack of outside buying market has been quite steady at 36d. Special inquiry on the 17th accounts for the sharp advance to 36⅜d. Tendency is favorable to some further advance.

Samuel Montagu & Co., London, report under date of Dec. 28, 1916, that about £1,000,000 of silver has been acquired by the Indian government at Bombay and Calcutta. Combined shipments from London to India and China during 1915 and 1916 were remarkably similar in amount—the former about £140,000 under, and the latter about £140,000 over £4,000,000.

Mexican dollars in New York were quoted on Jan. 11, 57⅞@60⅞; 12, 57⅜@60⅜; 13, 57⅜@60⅜; 15, 57⅜@60⅜; 16, 57⅜@60⅜; 17, 57¼@60¼.

Platinum—Sales were reported this week at $86, which was an advance from the beginning of the week. At the close it was a little higher. We quote the market at $82.50, opening, $87.50, closing.

Palladium—Quoted $70 per oz.

Zinc and Lead Ore Markets

Platteville, Wis., Jan. 13—Quotations for the district are according to the following figures: Base price per 2000-lb. ton for material assaying 60% zinc is $72.50 for premium ore down to $70 for medium grade. Base price per 2000-lb. ton for material assaying 80% lead is $90. Shipments for the week are: 2363 tons of zinc ore, 107 tons of lead ore, and 467 tons of sulphur ore. For the year to date the figures are: 5129 tons of zinc ore, 174 tons of lead ore, and 981 tons of sulphur ore. Shipped during the week to separating plants, 3323 tons of zinc ore.

Joplin, Mo., Jan. 13—Price quotations per 2000 lb.: blende, high $79; 60% zinc, premium ore, $75; medium, $76@70, low, $67. Calamine, per ton 40% zinc, $50@47.50. Average selling price, all grades of zinc, $66.58 per ton.

Lead, high price $92.70, base $92@88; average selling price, all grades of lead $87.87 per ton.

Shipments the week: Blende, 7934 tons; calamine, 599 tons; lead, 1593 tons. Values, all ores the week, $730,600; the two weeks, $1,341,430.

That medium-grade ore sold on higher base than premium ore illustrates the peculiar demand of purchasers.

The larger shipment of calamine is a direct result of two weeks of fine weather, but tonight everything is frozen up with the district wrapped in a cold wave and zero weather promised.

The continued declining market for premium ore is still opposed by some sellers declining to sell.

Other Ores

Molybdenum Ore—Quoted at $1.79@1.90 per lb. of molybdenum sulphide.

Antimony Ore is in demand, but supplies are scarce; $1.50 is being offered without getting ore.

Manganese Ore—Imports at Baltimore during the week included 8150 tons of manganese ore from Brazil.

Tungsten Ore—Transactions were reported amounting to several hundred tons, both for home and foreign consumption. Europe desires to buy 200 tons more, but does not yet offer the price demanded here. Transactions of the week were done chiefly at $17.

Other Minerals

(Quoted by Foote Mineral Co., Philadelphia)

Cerium-Iron Alloy—Demand is good and firm at $28 per lb.

SILVER AND STERLING EXCHANGE

Jan.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Jan.	Sterling, Exchange	Silver New York, Cents	Silver London, Pence
11	4.7575	74⅜	36⅛	15	4.7581	74⅜	36
12	4.7581	74⅜	36	16	4.7581	74¼	36
13	4.7581	74⅜	36	17	4.7581	75	36⅜

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Jan.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
	26½		7.20		8½
11	@27½	42.75	@7.40	@ 9	
	26½		7.20		8½
12	@27½	43.25	@7.40	@ 9½	
	27		7.25		8½
13	@28	43.25	@7.50	@ 9½	
	28		7.35		9
15	@29	44.10	@7.50	@ 9½	
	28		7.35		9½
16	@29	44.50	@7.50	@ 9½	
	28		7.35		9½
17	@29	44.75	@7.50	@10	

The above quotations are our appraisal of the average of the major market based generally on sales as made and reported by producers and agencies; and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold on "regular terms" (r.t.), including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Jan.	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
11	130	126	141	182¾	184½	30½	49½
12	130	126	141	184½	186	30½	45½
13	....	....	....	....	....	....	....
15	130	126	141	186	187¾	30½	45½
16	....	....	....	....	....	....	....
17	....	....	....	....	....	....	....

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.86c. Variations, £1 = 0.21½ cents.

Chromium—Weather conditions are interfering with shipments of Coast ore. Price firm, at $1 per unit for 40%. Ferrochromium unchanged at 19c. per lb. for car lots.

Fluorine—Demand has been responsible for sharp price advances. Fluxing, 95%, $28 per net ton; acid, 98%, $32; metallurgical, 85%, $26.

Iron Trade Review

NEW YORK—Jan. 17

According to the review of the iron market by "Iron Age," for Jan. 18, the steel market is quieter. More attention is given to possible effects of the falling off in the export movement, attributed both to the scarcity of ocean bottoms and to the refusal by railroads of steel and pig iron destined for the seaboard.

PITTSBURGH—Jan. 16

Transportation conditions have grown much worse, since the improvement noted a week ago. there having been real winter weather for about a week past. The Connellsville coke region has been very short of cars. The Carnegie Steel Co., which had gotten into operation the 14 blast furnaces banked just before Christmas, has had to bank several furnaces again. All the steel works in the Pittsburgh and valley districts are suffering from inadequate car supplies for shipping finished product, but are hampered still more by the slow removal of loaded cars, and at many works there is danger of the interchange tracks becoming blockaded, which would stop nearly everything. Embargoes prevent shipments to many points, necessitating frequent changes in rolling schedules and cutting down output slightly merely by reason of the changes. Numerically box cars are more plentiful, but many of the box cars furnished come under the rule of foreign cars being returned to their own roads, so that they can be loaded only for shipment in certain directions. With a week or two more of conditions such as have obtained in the past few days the production of finished steel will be seriously curtailed.

The finished steel market is a trifle more active. There is an insistent demand for ship plates, and higher prices than ever are being paid, even above 6c. for second-quarter shipment. Other steel products show some activity, though chiefly for the early deliveries. There is no weakness in prices at any point. Even with a continuously dull market the steel mills should be able to operate at capacity during by far the major portion of the year.

The bimonthly adjustment of the Amalgamated Association's sheet-mill wage scale was on a basis of 2.80c. for 26, 27 and 28 gage, indicating that shipments from the selected mills represented an average of about 2.90c. for 28 gage, without discount, or $32 a net ton below the present market minimum of 4.50c. The incident is fairly typical of many branches of the finished steel trade, consumers paying, for the steel actually received, much less than the present market and suggesting that consumption will decrease as old contracts are worked out. At the same time exports are certain to decrease owing to the increasing scarcity of bottoms, and meanwhile productive capacity is increasing, so that the steel trade cannot go on indefinitely at the present pace and with present prices.

Pig Iron—There is considerable export inquiry for basic and bessemer iron and fair-sized sales have lately been made. There is a fair run of domestic inquiry for basic iron, chiefly for deliveries in the next few months. The market is practically as firm as a month ago though not so active. Southern iron is a bar against activity in local foundry iron, as it can be had at $24, Birmingham, or $28.55, Pittsburgh, while valley foundry is held at not under $30, valley, or $30.95, Pittsburgh. The foundries are not disposed, usually, to change their mix to take advantage of small quantities of Southern iron, but they would not make large commitments in Northern iron. In basic the same problem is not presented as offerings of Southern basic for this year have been absorbed. We quote: Bessemer, $35@36; basic, $30@31; foundry and malleable, $30@32; forge $29@30, f.o.b. valley furnaces, 95c. higher delivered Pittsburgh.

Steel—The scarcity of steel is more pronounced, if such a thing is possible. Only odd lots can be picked up, and that only occasionally. Bessemer and open-hearth billets and sheet bars are $60@65, rods being about $75 and forging billets about $80.

Foreign Iron

The British pig-iron market, according to a cable of Jan. 10, from London, to "Iron Age," is more active, with a heavy forward demand for hematite iron. American billets are strong, but business is difficult. Wire rods are quoted at $85 f.o.b. New York. Tin plates are unsettled, with leading works taking government orders at 25s. 6d. net. Ferromanganese is irregular, about £34 being asked for forward delivery—£36 for first half.

British iron and steel exports in November, 1916, were 224,554 gross tons, excluding iron ore and including scrap.

STOCK QUOTATIONS

N. Y. EXCH.†	Jan. 16
Alaska Gold M.	9⅛
Alaska Juneau	7⅛
Am.Sm.&Ref.,com.	108⅜
Am. Sm. & Ref., pf.	116¼
Am. Sm. Sec., pf. A	99
Am. Sm. Sec., pf. B.	94⅛
Am. Zinc	37⅛
Am. Zinc, pf.	65⅛
Anaconda	86⅛
Batopilas Min.	·1⅛
Bethlehem Steel	470
Bethlehem Steel, pf.	135
Butte & Superior	49
Chile Cop.	26⅛
Chino	55⅞
Colo.Fuel & Iron	46⅛
Crucible Steel	65⅛
Dome Mines	22
Federal M. & S.	13
Federal M. & S., pf.	41
Great Nor., ore ctf.	36⅛
Greene Cananea	44⅛
Homestake	125
Inspiration Con.	59⅛
International Nickel	42
Kennecott	47
Lackawanna Steel	86
Miami Copper	42
Nat'l Lead, com.	60
National Lead, pf.	112⅛
Nev. Consol.	24⅛
Ontario Min.	5⅛
Quicksilver	2
Quicksilver, pf.	2⅛
Ray Con.	27⅛
Republic I.&S.,com.	80
Republic I. & S. pf.	104⅛
Sloss-Sheffield	70⅛
Tennessee C. & C.	15⅛
U. S. Steel, com.	115
U. S. Steel, pf.	120⅞
Utah Copper	108
Va. Iron C. & C.	48

N. Y. CURB†	Jan. 16
Buffalo Mines	1
Butte & N. Y.	‡1⅛
Butte C. & Z.	10
Caledonia	.54
Can. Cop. Corpn	1⅛
Cashboy	.06
Cerro de Pasco	36⅛
Con. Ariz. Sm.	1⅛
Con. Coppermines	3⅛
Con. Nev.-Utah	·⅛
Crystal Cop.	1
First Nat. Cop.	3⅛
Florence	.70
Goldfield Con.	.65
Goldfield Merger	.07
Granite	.38
Hecla Min.	7⅛
Howe Sound	7⅛
Jerome Verde	1⅛
Joplin Ore & Spel.	‡.34
Kerr Lake	4⅛
Magma	50⅛
Majestic	·⅛
McKinley-Dar-Sa.	.50
Mother Lode	.43⅛
Nevada Hills	.20
N. Y. & Hond.	15
Nipissing Mines	8⅛
Oro	‡.03⅛
Ray Hercules	4⅛
Rochester Mines	.63
St. Joseph Lead	17⅛
Standard S. L.	.75
Stewart	.21⅛
Success	.41
Tonopah	5⅛
Tonopah Ex.	4
Trihullion	·⅛
Troy Arizona	.54
United Verde Ext.	38⅛
United Zinc	4⅛
White Knob, pf.	1⅛
White Oaks	3⅛
Yukon Gold	2⅛

SAN FRAN.*	Jan. 16
Alta	.04
Andes	.20
Best & Belcher	.05
Bullion	.01
Caledonia	.25
Challenge Con.	.05
Confidence	.10
Con. Virginia	.09
Gould & Curry	.02
Hale & Norcross	.07
Jacket-Cr. Pt.	.03
Mexican	.09
Occidental	.65
Ophir	.18
Overman	.04
Savage	.07
Sep Belcher	.03
Sierra Nevada	.20
Union Con.	.39
Utah Con.	.02
Belmont	4.40
Jim Butler	.72
MacNamara	.07
Midway	.22
Mont.-Tonopah	.19
North Star	.17
Rescue Eula	.24
West End Con.	.69
Atlanta	.12
Booth	.09
C.O.D. Con	‡.02
Comb. Frac	.05
D'field B.B.	.04
D'field Daisy	.04
Florence	.20
Jumbo Extension	.35
Round Mountain	.39
Silver Pick	.23
Argo	.07
Ariz. Central	.10
Big Jim	1.25
Lazy Boy	.05
Nellie	.25
Tom Reed	1.87½
United Eastern	5.00
United Western	.03

BOSTON EXCH.*	Jan. 16
Adventure	3⅛
Ahmeek	105
Algomah	1
Allouez	66⅛
Ariz. Com., ctfs.	13⅛
Bonanza	.35
Butte-Ballaklava	1⅛
Calumet & Ariz.	79⅛
Calumet & Hecla	555
Centennial	26⅛
Copper Range	67⅛
Daly West	2
East Butte	14⅛
Franklin	8⅛
Granby	91⅛
Hancock	18
Hedley	‡24
Helvetia	.50
Indiana	2⅛
Island Cr'k, com.	65⅛
Isle Royale	34⅛
Keweenaw	3⅛
Lake	16
La Salle	4⅛
Mason Valley	6⅛
Mass	15⅛
Mayflower	3
Michigan	3
Mohawk	85⅛
New Arcadian	4⅛
New Idria	13⅛
North Butte	22¼
North Lake	2
Ojibway	2⅛
Old Colony	2⅛
Old Dominion	64
Osceola	86
Quincy	88⅛
St. Mary's M. L.	86⅛
Santa Fe	1⅛
Shannon	9⅛
Shattuck-Ariz.	27
So. Lake	5
So. Utah	.25
Superior	15⅛
Superior & Bost.	7⅛
Tamarack	57⅛
Trinity	5
Tuolumne	1⅛
U. S. Smelting	64⅛
U. S. Smelt'g, pf.	51⅛
Utah Apex	2⅛
Utah Con.	18⅛
Utah Metal	6⅛
Victoria	5
Winona	4⅛
Wolverine	47⅛
Wyandot	1⅛

BOSTON CURB*	Jan. 16
Alaska Mines Corp	1
Bingham Mines	8⅛
Boston Ely	.55
Boston & Mont.	.75
Butte & Lon'n Dev	.25
Calaveras	3⅛
Calumet-Corbin	.01⅛
Chief Con.	1¼
Cortez	.35
Crown Reserve	.43
Davis-Daly	7⅛
Eagle & Blue Bell	1⅛
Houghton Copper	1⅛
Iron Cap Cop., pf.	20⅛
Mexican Metals	.30
Mines of America	2⅛
Mojave Tungsten	1⅛
Nat. Zinc & Lead	.55
Nevada-Douglas	1⅛
New Baltic	2⅛
New Cornelia	18
Ohio Copper	1⅛
Oneco	.75
Pacific Mines	35
Rex Cons	.48
Rilla	.05

SALT LAKE*	Jan. 16
Big Four	.90
Black Jack	.07
Cardiff	5.50
Colorado Mining	.17
Crown Point	.04
Daly-Judge	8.00
Emma Cop.	2
Empire Copper	1.60
Gold Chain	.15
Grand Central	.52
Iron Blossom	1.17½
Lower Mammoth	.06
May Day	10⅛
Opohongo	‡.01
Prince Con.	1.30
Seven Troughs	‡.04
Silver-King Coal'n	3.10
Silver King Con.	4.25
Sioux Con.	.13
So. Hecla	1.30
Uncle Sam	.04
Wilbert	.10
Yankee	.16

TORONTO*	Jan. 16
Bailey	.06⅛
Beaver Con.	.38⅛
Chambers Ferland	.16
Coniagas	4.60
La Rose	.53
Peterson Lake	.10
Right of Way	.05
T. & Hudson Bay	72.00
Temiskaming	.60
Wettlaufer-Lor.	.08
Dome Exten.	.28
Dome Lake	.60
Foley O'Brien	.70
Hollinger	6.70
Jupiter	.32
McIntyre	1.95
Newray	1.39
Porcu. Crown	.80
Schumacher	.68
Vipond	.47
West Dome	.30

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Jan. 16
Cresson Con.	7.25
Doctor Jack Pot.	.09⅛
Elkton Con.	.13
El Paso	.40
Findlay	.06
Gold Sovereign	.06⅛
Golden Cycle	2.57
Granite	.60
Isabella	.22⅛
Mary McKinney	.26
Portland	1.95
Vindicator	1.34

LONDON	Dec. 30
Alaska Mexican	£0 12s 6d
Alaska Tre'dwell	2 12 6
Burma Corp.	3 13 9
Cam & Motor	0 9 9
Camp Bird	0 6 0
El Oro	0 7 3
Esperanza	0 9 3
Mexico Mines	3 10 0
Nechi, pfd.	0 12 3
Oroville	0 15 9
Santa Ger t'dis	0 9 3
Tomboy	1 1 0

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1914	1915	1916	1914	1915	1916
January	56.572	48.855	56.775	26.553	22.731	26.960
February	57.506	48.477	56.755	26.573	22.753	26.975
March	58.067	50.241	57.935	26.788	23.708	27.597
April	58.519	50.250	64.415	26.958	23.709	30.662
May	58.175	49.915	74.269	26.704	23.570	35.477
June	56.471	49.034	65.024	25.948	23.267	31.060
July	54.678	47.519	62.940	25.219	22.597	30.000
August	54.344	47.163	66.083	25.979	22.780	31.498
September	53.290	48.680	68.515	24.260	23.591	32.584
October	50.654	49.385	67.855	23.199	23.925	32.361
November	49.082	51.714	71.604	22.703	25.094	34.192
December	49.375	54.971	75.765	22.900	26.373	36.410
Year	54.811	49.684	65.661	25.314	23.675	31.315

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1915	1916	1915	1916	1915	1916
Jan.	13.641	24.008	60.756	88.083	65.719	116.167
Feb	14.394	26.440	63.494	102.667	*	133.167
Mar.	14.787	26.310	66.152	107.714	*	136.000
April	16.811	27.895	75.096	124.319	*	137.389
May	18.506	28.625	77.600	135.457	*	152.522
June	19.477	26.601	82.574	112.432	95.333	137.455
July	18.796	23.865	76.011	95.119	91.409	125.500
Aug.	16.941	26.120	68.673	110.283	82.333	126.304
Sept.	17.502	26.855	68.915	113.905	85.250	134.071
Oct.	17.686	27.193	72.601	122.750	88.000	142.523
Nov.	18.627	30.625	77.744	134.659	93.273	155.432
Dec.	20.133	31.890	80.773	145.316	100.430	162.842
Year	17.275	27.202	72.532	116.059	.....	138.281

Tin	New York		London	
	1915	1916	1915	1916
January	34.260	41.825	156.550	175.548
February	37.415	42.717	176.925	181.107
March	48.426	50.741	180.141	193.609
April	47.884	51.230	166.225	199.736
May	38.790	49.125	162.675	196.511
June	40.288	42.231	167.636	179.466
July	37.423	38.510	167.080	168.357
August	34.389	38.565	151.440	169.870
September	33.125	38.830	152.625	171.345
October	33.080	41.241	151.554	179.307
November	39.224	44.109	167.670	186.932
December	38.779	42.635	167.000	183.368
Av. year	38.590	43.480	163.960	182.096

Lead	New York		St. Louis		London	
	1915	1916	1915	1916	1915	1916
January	3.729	5.921	3.548	5.826	18.606	31.167
February	3.827	6.246	3.718	6.164	19.122	31.988
March	4.053	7.136	3.997	7.375	21.883	34.440
April	4.221	7.630	4.142	7.655	21.094	34.368
May	4.274	7.463	4.182	7.332	20.347	32.967
June	5.932	6.936	5.836	6.749	25.170	31.011
July	5.659	6.352	5.531	6.185	24.611	28.137
August	4.656	6.244	4.520	6.088	21.946	29.734
September	4.610	6.810	4.490	6.699	23.151	30.786
October	4.600	7.000	4.499	6.898	23.994	30.716
November	5.155	7.042	5.078	6.945	26.278	30.500
December	5.355	7.513	5.266	7.405	28.807	30.500
Year	4.673	6.858	4.567	6.777	22.917	31.359

Spelter	New York		St. Louis		London	
	1915	1916	1915	1916	1915	1916
Jan.	6.386	16.915	6.211	16.745	30.844	89.810
Feb	8.436	18.420	8.255	18.260	39.819	97.762
Mar.	8.541	16.846	8.360	16.676	44.141	95.048
April	10.012	16.695	9.837	16.525	49.888	99.056
May	14.781	14.276	14.610	14.106	68.100	94.217
June	21.208	11.752	21.038	11.582	100.614	68.591
July	19.026	8.925	18.856	8.755	97.250	50.750
August	12.781	8.730	12.611	8.560	67.786	51.587
September	13.440	8.990	13.270	8.820	67.841	52.095
October	12.800	9.829	12.596	9.659	66.536	54.159
November	15.962	11.592	15.792	11.422	88.409	56.023
December	15.391	10.665	15.221	10.495	89.400	55.842
Year	13.230	12.804	13.054	12.634	67.553	72.071

New York and St. Louis quotations, cents per pound, London, pounds sterling per long ton. * Not reported.

Pig Iron, Pitts.	Bessemer‡		Basic‡		No. 2 Foundry	
	1915	1916	1915	1916	1915	1916
January	$14.59	$21.60	$13.45	$18.78	$13.90	$19.70
February	14.55	21.16	13.45	18.93	13.90	19.51
March	14.55	21.81	13.45	19.20	13.95	19.45
April	14.55	21.65	13.45	18.95	13.95	19.45
May	14.61	21.78	13.60	19.11	13.83	19.58
June	14.70	21.95	13.67	18.95	13.77	19.34
July	14.94	21.95	13.91	18.95	13.68	19.20
August	16.01	21.95	15.31	18.95	14.75	19.22
September	16.86	22.88	15.95	19.58	15.70	19.53
October	16.95	24.61	15.96	21.26	15.80	21.51
November	17.57	30.07	16.47	28.18	17.20	26.55
December	19.97	35.16	18.44	30.95	18.95	30.79
Year	$15.82	$23.88	$14.76	$20.98	$14.95	$21.15

‡ As reported by W. P. Snyder & Co.